# FOOD MANUFACTURE

Vol. XX, No. 10 October 1, 1945

## Contents

| | Page |
|---|---|
| Editorial | 347 |
| Air Conditioning in the Food Factory. Part I. Frank H. Slade, A.M.I.Mech.E. | 351 |
| The Manufacture of Sausage Rusks. Specially Contributed | 358 |
| Semi-Micro Analysis | 360 |
| Food Rations in France | 360 |
| Rebuilding Family Life | 361 |
| Grading Peas by Specific Gravity | 362 |
| The Complexities of Vitamin B. Specially Contributed | 364 |
| The Drying of Potatoes. Part III. H. G. Wager, R. G. Tomkins, S. T. P. Brightwell, R. J. L. Allen, and L. W. Mapson | 367 |
| Jam Manufacture. Part V. George Rauch | 372 |
| New Issues of Capital | 375 |
| Trade News | 376 |
| Information and Advice | 383 |
| Recent Patents, Trade Marks and New Companies | 384 |

**Published on the first day of the Month**

by

**LEONARD HILL LIMITED**

**17, Stratford Place, London, W.1**

Telephone: Mayfair 7383

**SUBSCRIPTION**

| | |
|---|---|
| **Single Copies** | **1s.** |
| **Annual Subscription** | **10s.** |
| **Abroad** | **12s. 6d.** |

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

## An Unstandardised Standard

IN January, 1944, the Ministry of Food issued an Order creating a standard for self-raising flour. The main features were that it shall yield not less than 0·45 per cent. of available carbon dioxide and not more than 0·65 per cent. of total carbon dioxide, together with very meagre instructions for the determination of available carbon dioxide.

Subsequent events have evidently proved that the standard referred to was unsatisfactory or, in fact, unstandardised. This is shown by the recent Press Notice (P.N. 3745), dated August 9, 1945, in which considerable modifications are indicated. This Notice states *inter alia* that

> shortly after the issue of the Order complaints were made that the prescribed analytical details were not sufficient . . . and appreciably different results were being obtained in different laboratories, even by trade chemists who were familiar with the difficulties arising in the analytical examination of self-raising flour.

This led to a meeting between the analyst members of the Standards Committee and a number of trade chemists at which the standard was fully discussed. Incidentally, we wonder how the differentiation in terms is arrived at. Are not the trade chemists worthy of the term analyst? A number we know certainly can boast the F.R.I.C. after their names. After the deliberations of this meeting the memorandum we are now discussing was issued. Its main feature is a lengthy dissertation on the methods of analysis, which are certainly amended and amplified. We need not enter into the details here—those can be left to the analysts and the trade chemists. The final recommendations are that the standard of self-raising flour should be amended by deleting the figure for total carbon dioxide and replacing the method for the determination of residual carbon dioxide at present set out by a more detailed procedure. There is no provision for a maximum limit for residual carbon dioxide, and the memorandum ends with

> on the basis of the information available at present no change should be made in the existing figure of 0·45 per cent. for the minimum content of available carbon dioxide.

So far as we can gather from the memorandum, this very serious decision has been made from results obtained on scones at an Army bakehouse and steamed puddings at the Cereals Research Laboratory at St. Albans. We wonder what the reactions of the "trade chemists," with their elaborate experimental bakeries and vast researches into all possible types of cooking with self-raising flour, will be to this somewhat cavalier decision. Evidently the Ministry of Food is not happy about it, as the Press Notice states that "any manufacturers or other party desiring to make any comment on the recommendations should send them to the Cereal Products Division not later than August 31, 1945." We imagine that there will be many comments on this unsatisfactory memorandum, and that further meetings will have to be held between the experts. Meanwhile the manufacturers of self-raising flour are faced with an unstandardised standard and the bogey of bogus prosecution.

## Sterilised Cream

After six years of experimental work a new form of sterilised cream which is claimed to keep fresh for more than a year at room temperatures is being produced in California. The product is suitable for whipping, and even when a year old is said to retain all its original qualities and flavour. The process is being watched with interest by creameries and other food industries in this country.

The process calls for care and accuracy. A small quantity of vegetable stabiliser, such as is used in ice cream, is added to the fresh cream. The quantity does not exceed one-quarter of 1 per cent. by weight. The object of the stabiliser is to prevent the milk solids in the final product from separating or coagulating during the long storage period.

The mixture is pre-heated and sterilised at temperatures varying from 260° F. to 280° F., then cooled rapidly and passed into sterile holding tanks, from which it is piped to the bottling room as required.

One of the most critical operations in the process is bottling and capping. In the bottling room germ-killing ultra-violet radiations are used to guard against airborne bacteria; and the operators wear sterilised white uniforms, gloves, and masks.

Bottles and caps are sterilised by steam at 275° F., for half an hour in a large retort, then placed on the conveyor belt which conveys them through a standard bottle-filling machine, through the capper, and thence to the labelling and case-filling equipment. Ultra-violet rays are used to protect the bottles and caps from the moment they leave the steriliser.

After bottling and capping, each day's production is stored for six days while numerous laboratory tests are made.

## Tin Cans

In his statement at the twenty-fourth annual meeting of the Metal Box Company, Sir Robert Barlow mentioned some of the problems connected with the provision of canned foods for the Forces during the war. Among these were the production of containers to be carried unpressurised to an altitude of 50,000 feet, where the barometric pressure falls from 30″ to 3″ and the temperature to 100° F. below freezing point; production of containers to withstand the hazards of transportation to the Pacific and the climatic conditions there of temperatures up to 115° F. with a humidity of over 95 per cent.; production of containers for use in submarines, in the galleries of the Rock of Gibraltar, and in open lifeboats and rafts.

All these and many others came our way (said Sir Robert) with the stipulation that despite the conditions encountered, the man opening the container should find the food or drink therein to be in a wholesome and attractive state, or the ammunition capable of use. There was only one notable exception to this general stipulation, and that was when we were asked to design a container that would burst—and burst in a particular manner.

Sir Robert considered that it was no exaggeration to say that only containers made of tinplate, or in some cases aluminium, had been proved capable of the required performance.

Since Napoleon initiated the preservation of foods in tin cans, increasing use, in peace and war, has been found for the metal container. In Sir Robert's judgment, there is no other container which combines the advantages of strength, lightness, opacity, resistance to attack by vermin, and is capable of being hermetically sealed.

## One Man's Meat . . .

The imposition of American foods and food habits upon other nations is postulated as a certain cause of failure in the solution of their nutrition problems by R. S. Harris, writing in *Science* (1945, **102**, 2637, p. 42). America, and any other major power responsible for feeding the world, should give its knowledge and skill to the needy nations and regard the habits of peoples with long-established food cultures as inviolable.

The writer describes investigations into the dietary habits of Mexico, in which several nutritious food plants were encountered which are eaten by many Mexicans. The leaves of malva, an uncultivated plant growing on the plateau, are eaten similarly to spinach. Consumption of 100 g. of malva supplies 40 per cent. of the calcium, 40 per cent. of the iron, 140 per cent. of the vitamin A (as carotene), 60 per cent. of the ascorbic acid, and a large portion of the thiamine and niacin allowances for the adult man. Especially rich in

various nutrients are charal, sesame seed, calabaza seed, pulque, piñon, and corn tortilla.

The high nutritive value of the native Mexican foods is shown by the fact that malnutrition appeared to be no commoner among a group of 1,000 poverty-stricken Mexican children than in a group of 800 children from middle-class Michigan families. In the arid and desolate Mesquital valley the native tribes have survived through centuries upon foods gleaned from the harsh soil and show little sign of malnutrition. Quality of the diet is satisfactory, although the problem of under-nutrition is present because of insufficient quantities for growth and development. Each food habit investigated in Mesquital had a scientific justification. The lime used in the treatment of corn during the preparation of tortilla contributes much calcium to an otherwise calcium-deficient diet. Hot chili is surprisingly rich in carotene, and as little as 6 g. of some varieties provides the entire daily allowance of vitamin A.

The frequent scientific justification of food habits gives weight to the author's argument that these habits should not be altered until there is a certainty that the substituted foods will be as nutritious as those replaced. He advocates the exact analysis of all edible plants for important nutrients as the basis of a sound food, nutrition, and agricultural programme for any country. The formula for crops should be the greatest yield with the most nutrition at the lowest cost. Geneticists could also be guided in the selection of the most nutritious strains and varieties of plants by food analysis. Preliminary studies indicated that corn breeding could significantly raise the niacin content of the Mexican dietary.

## Malnutrition Stalks Newfoundland

While we cannot believe that the grave extent of malnutrition in Newfoundland, revealed in the report of the Nutrition Council of the Newfoundland Medical Association, comes as a revelation to the Colonial Office, the uncomfortable facts which are soberly marshalled in it must shake the conscience of the average well-meaning, unwitting, and comparatively well-fed citizen of this country. It would make the choicest breakfast unpalatable to assimilate with it the fact that tuberculosis and infant mortality are rampant in this half-forgotten part of the Empire, mainly due to malnutrition, There is very little meat, eggs, milk, or vegetables available to the islanders, whose only plentiful food appears to be fish. This "depressing reading," as it is sternly characterised by the *British Medical Journal*, reports that assays of the foods eaten showed that apart from calories, protein, and nicotinic acid, all the calculations of the nutrients present were sadly below the intake recommended by the Food and Nutrition Board of the National Research Council, U.S.A. There are deficiencies of calcium, vitamin A, vitamin C, vitamin $B_1$, and riboflavin in the diet of the islanders when compared with the recommended standards.

Generally speaking, all the adults examined during the survey were under weight, although the children were of average weight. Most of the people were mentally slow, and the apathetic and subdued children resembled, in attitude and behaviour, little adult men and women. Age had outpaced the actual years of the islanders, and 10 per cent. of the persons examined were disfigured by coarse, straight, lustreless, "staring" hair.

The new Colonial Secretary, we know, has many pressing problems, but speedy steps to remove this blot on the record of our colonial administration should be a high priority. We underline the comment of the *B.M.J.*: "Without help from outside, improvement in the nutritional condition of the island is impossible."

## Dried Milk Production in Wartime

During the war increased spray drying, despite its high capital costs, has been the outstanding feature of dairy manufacture. The severe heat treatment involved in the cheaper roller process results in considerable protein coagulation and the powder produced possesses only 80 to 85 per cent. solubility. Spray process powder has 95 to 99 per cent. solubility.

Various other problems of dried milk production were tackled with increased vigour because of war needs, according to E. L. Crossley (*Agricultural Progress*, 1945, **20**, 5). Research to eliminate the development of the rancid flavour resulting from the atmospheric oxidation of the fat demonstrated experimentally that no rancidity or tallowiness developed in powders when sealed in an atmosphere containing less than 2 per cent. of oxygen. Even when the oxygen content was increased up to 6 per cent. the keeping quality at 37° C. was three times longer than in air.

The keeping quality of full cream spray dried milk was extended to seven years in temperate climates and at least three years in the tropics by the evolution of the gas packing process.

Research involving the use of 121,000 gallons of milk was carried out at an industrial plant in co-operation with the National Institute for Research in Dairying, the Hannah Dairy Research Institute, and the Low Temperature Research Station. The Agricultural Research Council provided a grant. This research showed that powders prepared from milk preheated at 190° F. remained free from tallowiness about three times as long as powders prepared from milk preheated at 165° F.

The reduction of bacterial and enzyme activity in the milk to a minimum at all stages preceding spray drying was important unless very high preheating temperatures could be employed. The use

of a clarifier had no appreciable effect upon any of the properties of milk powder.

The plate counts of milk powders were reduced to very low figures, frequently less than 1,000 per g., particularly when high temperature preheating was employed. Subsequent experience over a lengthy period has shown that the majority of counts can be maintained below 20,000 per g. This standard demands meticulous plant sterilisation and the prevention of bacterial multiplication at danger points. In practice, successful plant management depends upon (1) efficient detergent treatment, (2) steam sterilisation of all separate parts which can be dismantled, followed in any case by efficient steam sterilisation of every portion of the plant when assembled for use, and (3) final hypochlorite treatment of the whole plant.

The vitamin contents of the various dried milks were studied over a storage period of twelve months, and it was shown that preheating at 190° F. was no more deleterious to vitamins A, B, and C than was preheating at 165° F. High temperature preheating improved the stability of vitamins A and C during storage. Even greater protection was obtained by combining gas packing with high temperature preheating.

Although probably unnecessary for many normal requirements, gas packing remains the only certain method of avoiding deterioration in tropical climates or during storage over several years.

## Ice Cream Prices

The scheme announced by Sir Ben Smith, Minister of Food, to limit the retail prices of ice cream to 50 per cent. above the pre-war level has had an immediate effect. Yet the scheme is operating without the backing of a statutory order.

Numbers of firms, particularly small businesses and street traders, have halved their prices since the scheme was announced. Some have gone so far as to display notices to the effect that their new charges are "controlled prices." The fact that the number of traders has shown no diminution is regarded as an indication that traders are still able to make a reasonable profit.

It is significant that the large manufacturers have not had to adjust their prices in consequence of the control scheme, as the charges were less than 50 per cent. over the pre-war rates.

The Ministry has threatened to withhold allocations of ingredients from or to withdraw the catering licence from persistent offenders. It is this threat of being put out of business that has had such a swift effect.

One ice cream manufacturer, who used fresh cream as an ingredient before the war, informed FOOD MANUFACTURE that he thought a price increase of 50 per cent. too much for a product made with the ingredients now available. On the other hand, although the Ice Cream Alliance had advocated regulated prices of about 50 per cent. over the pre-war level, the Yorkshire Divisional Committee of the Alliance adopted a resolution to the effect that "a maximum increase of 100 per cent. over pre-war prices would be fair and reasonable, particularly in view of the restricted output permitted by the Ministry's allocations."

## More English Bacon

Discussions have taken place between the Bacon Marketing Board and the Ministry of Food in regard to the re-opening of bacon factories that have been closed during the war. This was revealed at the annual meeting of the Yorkshire Farmers' Bacon Factory, Ltd. Curers are hopeful that some of the closed factories will resume production at an early date.

During the past twelve months there has been an increase in the output of bacon in this country and a decrease in the quantity imported. Quantity, rather than quality, is still the national requirement, and the Agricultural Departments are anxious that farmers should make the best possible use of the larger rations of feeding-stuffs in order to produce as many pigs as possible by the end of 1946.

Curers agree that the time is not yet opportune for producing the light-weight lean baconer that was the pride of the pre-war bacon contract. Nevertheless, they feel that the action recently taken by the Departments in adjusting the price schedule for fat pigs so as to discourage the production of excessively heavy baconers does not go far enough. The present maximum price of 26s. per score pounds applies to pigs ranging from 6 score 11 pounds up to 10 score pounds deadweight. Curers have asked that a better price should be offered for baconers weighing between 7 score pounds and 8 score 10 pounds.

A point to be considered is whether pigs of this weight can be produced by the economic use of the feeding-stuffs now available. Curers believe that they can, and base their argument on the fact that the weights of 7 to 8½ score pounds come within the range on which the highest price is now paid. Some of the bacon now produced in this country is declared to be equal in quality to any arriving from Canada or Denmark, but it is considered that the time has arrived to raise the average quality as well as to increase the quantity of home-produced bacon.

**Special Dehydration Number**

Readers are advised that a few extra copies of the August issue of FOOD MANUFACTURE are available.

To avoid disappointment, application for these should be made as early as possible.

# Air Conditioning in the Food Factory

## Part I

FRANK H. SLADE, A.M.I.Mech E.

AIR conditioning has been defined as "the simultaneous control of all, or at least the first three, of the factors affecting both the physical and chemical conditions within any structure."

When applied to the food industry, the main factors to be considered include temperature, humidity, motion, distribution, and purity.

There is no standard air-conditioning plant for all purposes, the individual requirements of food processes being too varied for this to be practicable, and plant must be designed to meet individual cases. For example, a plant that would be suitable for the cutting-room in a bacon factory would be entirely unsuitable in the proof-room of a bakery, where the conditions of temperature and relative humidity are quite different.

### Factors Involved

Briefly, there are two sets of factors involved in the normal installation: (*a*) Cooling, dehumidification, motion, distribution, and purity. (*b*) Heating, humidification, motion, distribution, and purity.

Sensible and latent heat must be absorbed from the air when conditions (*a*) are required, and unless an adequate supply of cold well water is available, this heat exchange can only be obtained by refrigeration. Cooling and dehumidification are effected by cooling the air to below its dew-point temperature, thus causing a part of the moisture contained to condense and precipitate, and its reheating to secure the desired dry-bulb temperature and relative humidity.

Alternatively, the parallel flow method is employed to secure desired temperature and hygrometric conditions by splitting the airstream—by-passing a predetermined quantity, performing the process already outlined on the remainder, and then mixing the by-passed with the conditioned air.

Whatever method is adopted, one of two arrangements or a combination of these is used to cool the air to accomplish the sensible and latent heat exchange. These arrangements are: (1) Surface cooling, where the air is passed across a cold metal surface; (2) spray cooling, where air is passed through a cold liquid spray.

Alternatively, it is usual to secure the desired temperature and hygrometric conditions in combination with factors (*b*) by the use of an air washer in which humidification of the air is obtained either by preheating the air and washing it with recirculated spray water or using heated spray water.

### Cooling Methods

Surface cooling and dehumidification is carried out by fitting direct expansion coolers in the actual air stream, the refrigerant flowing through the cooler, thus absorbing the heat from the air to be cooled. Spray cooling is the cooling of air passing through the air-conditioning plant by water sprays, these being cooled by an independent cooler usually in the form of a shell and tube cooler, consisting of

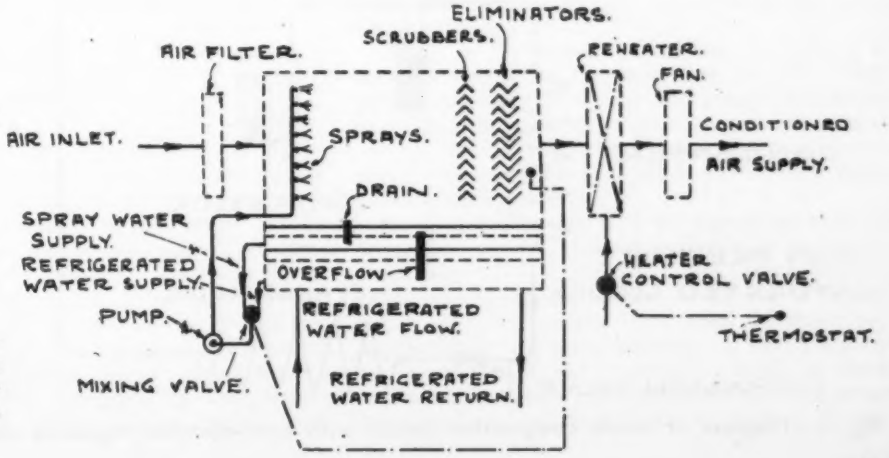



**Fig. 1. — Diagrammatic arrangement of air-washer for cooling and dehumidification.**

an outer casing with end plates into which tubes are expanded, the water flowing through the tubes which are surrounded by the refrigerant in the outer casing.

The cooling coils used for surface cooling consist either of bare pipe or tube of extended surface or fin construction. It is usual to use bare pipe where conditions cause frost accumulation. The current practice is to arrange these pipes at right angles to the air flow in successive banks, which are staggered so that the whole of the air is brought into contact with the cooling surface, and a sufficiently high air velocity is maintained to effect a satisfactory rate of heat exchange.

When finned coils are employed there are two methods of arrangement—staggered formation and in-line formation. By staggering the tubes a slightly higher rate of heat transfer is obtained, but the resistance to the air-flow is increased and in many cases difficulty is experienced in fixing the tube header and return tube bends, so it is usual to adopt the "in-line" formation. Fig. 1 illustrates diagrammatically a simple air-washer used for cooling and dehumidification, in which suitable temperatures are obtained by either one of the three following methods: (*a*) Evaporative cooling. (*b*) Cold water such as that obtained from a deep well or melting ice. (*c*) Cooling the water supplied to the washer sprays by refrigeration.

Considering (*a*) from the thermodynamics of air-water-vapour mixtures, it is known that the air can be cooled to within 80 per cent. of the initial wet-bulb depression; but, whereas the air can be cooled, it cannot be cooled low enough to effect dehumidification—that is, to the dew-point of the air in the conditioned space.

(*b*) Air cooling is effected and dehumidification provided when this source of supply is available. There are usually no difficulties to be experienced on this score when cold water from melting ice is utilised in the spray chamber, but unless ice is available at a very competitive price this method of operation is ruled out on the grounds of economy.

(*c*) Cooling the water by means of refrigeration is effective irrespective of locality and environment, being effected either by Baudelot coils placed beneath the chamber, over which the return water from the spray chamber circulates, or by an entirely separate cooling system. In the simple arrangement shown, the operations of cooling and dehumidification are carried out simultaneously by cooling the air in its passage through the chilled sprays. The moisture is condensed out as the temperature falls, and the plant is designed to produce saturated air of the correct dew-point temperature at the outlet of the washer, all entrained water being removed from the air-stream in its passage past the eliminator plates.

The dew-point temperature of the air leaving the washer is controlled by a thermostat being connected to apparatus which operates a mixing valve on the chilled water circulation, which by varying the mixture of chilled water from the refrigerating system with return spray water secures any desired dew-point temperature. The reheating coils controlling the dry-bulb temperature of the delivery air are themselves controlled by a thermostat situated in the conditioned space.

**Refrigeration**

For successful operation the choice of refrigerants is very limited. The refrigerants used should be chemically stable under all operating conditions, should not require excessively high pressures, and should be chemically inert to the material used in the construction of the machine and system. Some of the most commonly used refrigerants are am-

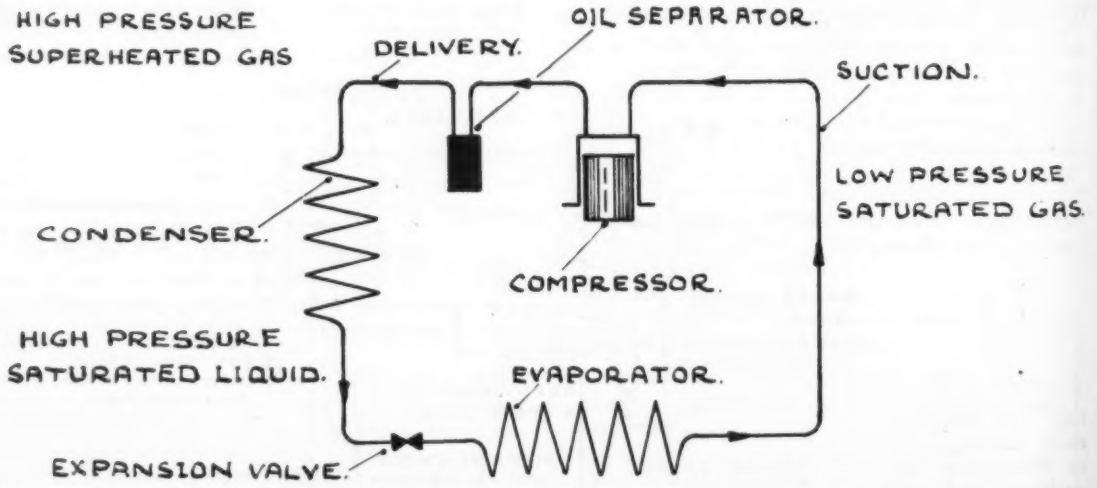



**Fig. 2.—Diagram of simple compression circuit with hand-operated regulator valve.**

monia, carbon dioxide, methyl chloride, sulphur dioxide, and Freon (dichlorodifluoromethane).

*Ammonia* as a refrigerant has been used extensively, mainly on account of its requirement of only medium pressure and temperatures, with a moderate compressor displacement. Another advantage is its high critical temperature, making it particularly suitable for use in the tropics, where low temperature condenser water is difficult to obtain.

Ammonia should be used with care in air conditioning on account of its toxic properties; its corrosive and suffocating action being dangerous to life, 0·5 to 1 per cent. will kill in a very short time, while 0·45 per cent. is dangerous in 30 to 60 minutes, and the maximum quantity that can be present in the atmosphere without any harmful effect being as low as 0·01 per cent. Therefore when ammonia is used as a refrigerant it is advisable to cool the water for the spray indirectly.

*Carbon dioxide* is used fairly extensively, owing to the fact that unless it is present in fairly large quantities in the atmosphere it is harmless to life. As a refrigerant it is limited to reasonably large plant; on account of its high working pressure it is not suitable for small units.

*Freon* as a refrigerant for air-conditioning purposes offers advantages not possessed by other refrigerants—it is non-toxic, non-inflammable, non-corrosive, and Freon-air mixtures are non-explosive. It is so harmless to human life that 50 per cent. must be present in the atmosphere to be harmful in 30 to 60 minutes, while 40 per cent. can be present in any space without danger.

**Two Refrigerating Systems**

There are two main refrigerating systems—the compression and the absorption system. The latter, however, is seldom encountered in air conditioning.

The compressors used to pump the refrigerant from the low-pressure or evaporator side to the high-pressure or condenser side in the mechanical or vapour compression refrigerating system can be of the following types:

1. Reciprocating compressors.
2. Centrifugal compressors.
3. Rotary compressors.
4. Steam jet compressors.

While each of these types is used for air conditioning to a lesser or greater degree, it is the current practice in this country to use either (1) or (4).

A diagrammatic arrangement of a simple vapour compression refrigerating system using a reciprocating compressor, to illustrate the sequence of events for wet compression, with hand-operated regulator is shown in Fig. 2. The plant has two main divisions: a high pressure or warm side, and a low pressure or cold side, the pressure difference being caused by the reciprocating compressor. These pressures are referred to as "head" and "back" pressures respectively; the function of each ensures that the head pressure is high enough to raise the boiling point above the temperature of the cooling water and the back pressure low enough to bring the boiling point of the refrigerant to a temperature lower than that required in the evaporator.

Thus the plant consists of four main parts—the evaporator, wherein the refrigerant at relatively low pressure is evaporated by absorbing heat from an external source; the compressor, which pumps the gas from the low evaporating pressure to the higher condensing pressure; the condenser, where the superheat due to compression and the latent heat of vaporisation is removed, thus changing the vapour to a liquid, finally cooling the liquid refrigerant to within a few degrees of the cooling water temperature before it passes to the regulator valve. The liquid expands at constant total heat at the regulator valve, during which process between 5 to 25 per cent. of the liquid is immediately evaporated, supercooling of the remainder of the liquid being effected by supplying the heat necessary to cause this vaporisation. The liquid passing the regulator proceeds through the evaporator coils and in the ideally regulated plant is all converted into a gas. Incorrect regulation will have two results: firstly, if there is too great a temperature difference between the refrigerant and medium being cooled, the liquid will be evaporated before completing its passage through the evaporator coils and superheated gas will be returned to the compressor. This is rectified by opening the regulator wider, allowing more liquid to enter the evaporator, thereby raising the evaporation pressure and temperature, and decreasing the temperature difference. Secondly, if there is insufficient temperature difference between the refrigerant and the medium being cooled, the liquid will not be completely evaporated and excess liquid or "slugs" will be carried over to the compressor, an inexactitude that is corrected by closing the regulator valve to reduce the quantity of liquid entering the coil, thereby increasing the temperature difference by lowering the evaporation pressure and temperature.

Owing to inevitable fluctuations in load, it is therefore impossible to secure a permanent setting with a hand-operated regulator which will allow the liquid refrigerant to pass the evaporator at exactly the same rate as it is formed in the condenser, and it is usual to fit a thermostatic regulator or similar device.

An arrangement whereby the expansion valve is opened as soon as liquid is present is an automatic expansion valve of the float type, which has the effect of keeping the condenser drained of liquid, a part of the condenser being used for supercooling the liquid after condensation. A liquid separator is provided in the evaporator circuit, in which free liquid in the gas returning from the evaporator is trapped and returned to the evaporator circuit,

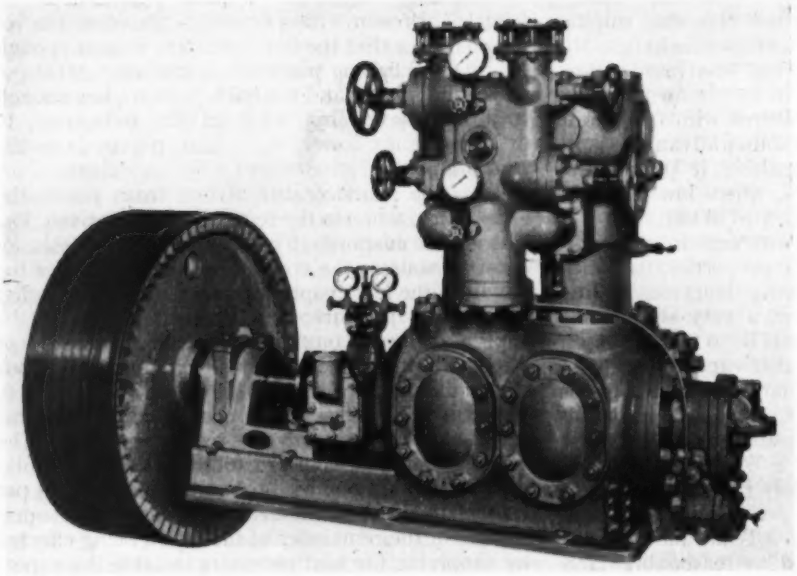


**Fig. 3. — " Monobloc " type $NH_3$ compressor arranged for drive by means of multiple " V " belts.**

*Courtesy of J. and E. Hall, Ltd.*

thereby providing a gas return to the compressor free of entrained liquid.

Developments in the design of refrigerating compressors have led to the adoption of the high-speed vertical compressor, this being accompanied by the usual increase in speed which is a result of the development of modern materials and modern workshop practice.

Modern compressors of large capacity occupying a relatively small floor space are illustrated in Figs. 3 and 4.

The steam jet system, shown in Fig. 5, is particularly suitable where an ample supply of process steam is available and large tonnage is required at temperatures around 40° F. The design is based upon the known physical law that if the absolute pressure above the surface of a liquid is lowered until it is less than the vapour pressure of the liquid, the liquid will " boil " and give off vapour until its temperature corresponds to the lowered pressure.

Thus, if in a water-vapour refrigerating plant the pressure is artificially reduced to, say, 0·36″ mercury absolute (29·63″ vacuum), the boiling point of the water within the plant will be reduced to 50° F. by a small proportion flashing into steam,

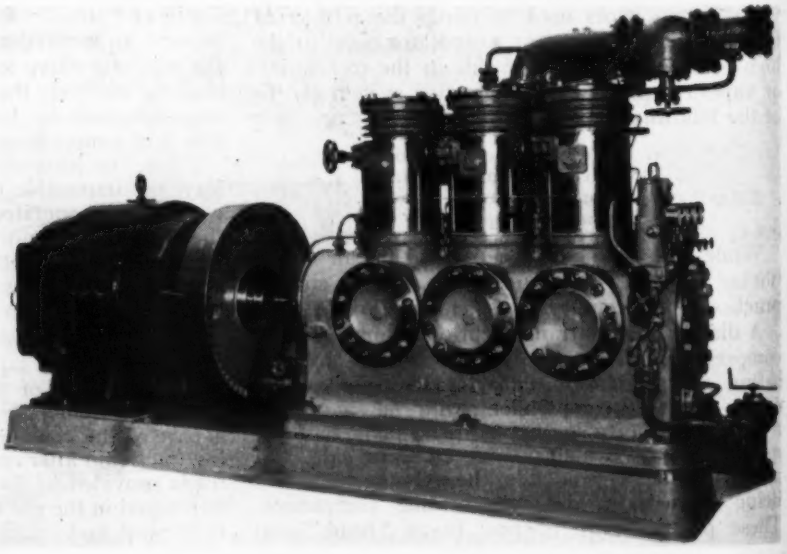


**Fig. 4.—High-speed compressor direct-coupled to an electric motor; this machine is equipped for use with " Freon " as a refrigerant.**

*Courtesy of J. and E. Hall, Ltd.*

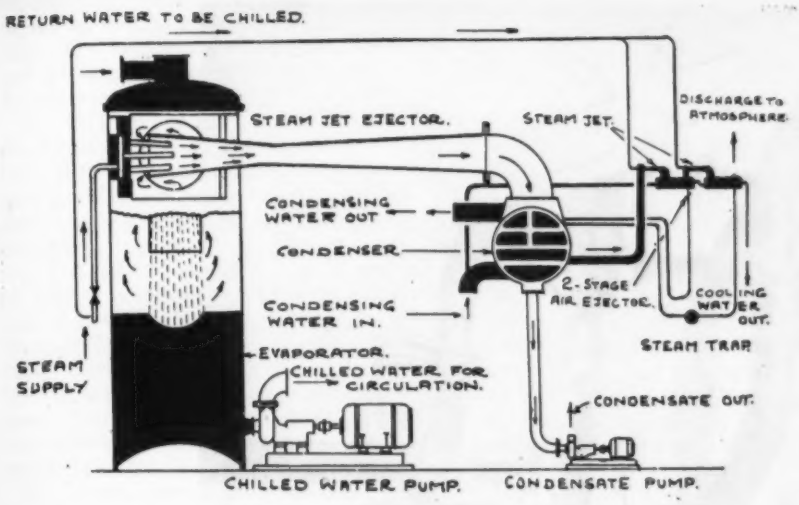



**Fig. 5.—Diagrammatic arrangement of the steam jet system.**

thereby extracting heat from the remaining unevaporated water until its temperature has fallen to 50° F.

To maintain a predetermined vacuum in the evaporator it is necessary to remove the water-vapour as rapidly as it forms. This is accomplished by the use of steam jet ejectors. The operation of the steam jet system is: steam issues at high velocity from the nozzles of steam jet ejectors and entrains and removes the large volume of water vapour forming in the evaporator, thereby maintaining the high vacuum necessary to cause evaporation at the desired chilled water temperature. The mixture of operating steam and water-vapour is compressed and discharged from the ejectors into the condenser where it is condensed, removed by a pump, and discharged as desired. The water chilled by evaporation is removed by a suit-

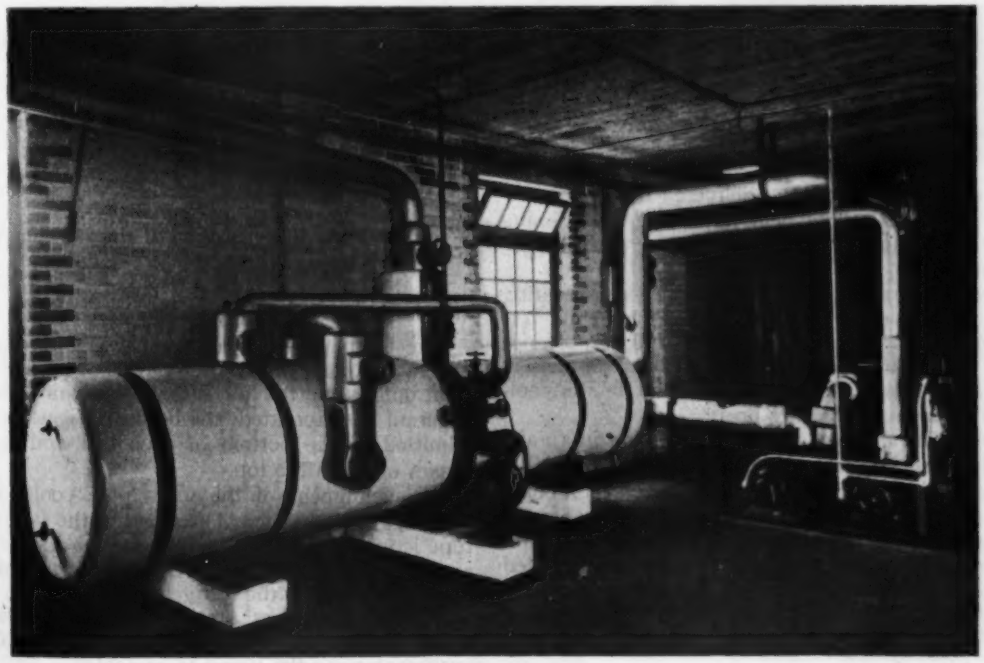


**Fig. 6.—Shell and tube evaporator fitted with a dome for the separation of entrained liquid.**
*Courtesy of J. and E. Hall, Ltd.*

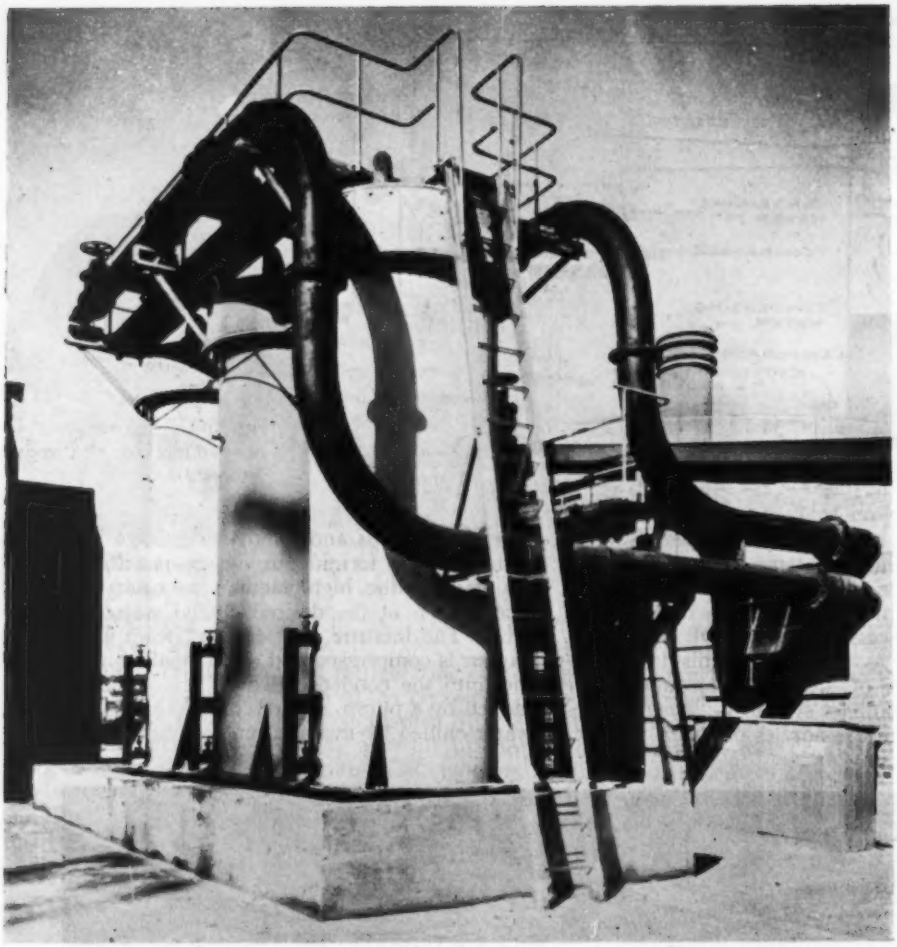


**Fig. 7.—Vertical shell and tube condensers.**

*Courtesy of J. and E. Hall, Ltd.*

able extraction pump and delivered to the point of use. After absorbing heat in the air-conditioning plant it is returned to the refrigerating plant for re-cooling.

The evaporator and condenser in a refrigerating system can be regarded as heat exchangers: (1) evaporators transferring heat from the substance to be cooled to the refrigerant, and (2) condensers transferring heat from the refrigerant to the cooling medium, either water or air.

When evaporators are used for cooling in an air-conditioning system, they can either be used for surface cooling of the air by direct-expansion coils, or to cool brine or water which is circulated through cooling coils situated in the air conditioner, or, on the other hand, to cool water which is circulated through the conditioning plant via water sprays.

The transfer of heat from either evaporators or condensers is influenced by many variables, these in the main being:

1. The temperature difference.
2. The design and surface arrangement of the coils.
3. The velocity and character of the surrounding medium.
4. The velocity and character of the medium within the tubes.

### Standard Types of Evaporators

Direct-expansion evaporators or air coolers generally consist of a series of coils of piping set at right angles to the air stream in which the refrigerant is evaporated, the liquid refrigerant being admitted to the bottom of each coil and the gas drawn off from the top.

A development of the plain pipe cooler is the grilled or finned tube. The effect of the use of this type is to create an external surface exposed to the air stream of some three to eight times the internal surface exposed to the refrigerant.

Submerged coolers are for cooling liquids, the simplest form being a coil or piping submerged in a tank containing the liquid to be cooled.

Baudelot coolers consist of a stack of horizontal pipes one above the other, the ends being con-

nected by return bends so as to form a continuous coil. The refrigerant evaporates inside the pipes, and the liquid to be cooled is caused to trickle over the outside in a thin film.

The shell and tube type of cooler, or evaporator, illustrated in Fig. 6, consists of a cylindrical steel shell with tube plates welded to each end. The cooling surface is provided by a number of straight tubes passing longitudinally through the stack and expanded into the tube plates. The liquid refrigerant passes through the shell, and gas is drawn off from a dome provided for the separation of entrained liquid, while the liquid to be cooled passes through the tubes, which are short, vertical, or inclined tubes connected to top and bottom headers, the water flowing over the tubes either by gravitation or forced circulation, or tubes grouped together and surrounded by a trough to form a race down which flows the liquid to be cooled.

To secure the most economical and efficient operation of a refrigerating plant the temperature difference between the refrigerant and the medium being cooled should be kept as low as possible; consequently, in practice the evaporating temperature should be a few degrees lower than the temperature of the substance being cooled—normally between the limits of 5° F. and 15° F.

It is usual to employ water for condenser cooling, although air cooling is resorted to in the smaller types of plant, and in cases where water is at a premium the water is either cooled atmospherically in a cooling tower, or the refrigerant is cooled both by water and air in an evaporative condenser.

Atmospheric condensers are the simplest form of condensers, and are constructed of vertical stacks of horizontal pipes, the gas being admitted to the top and liquid drawn off at the bottom. The water runs down the outside of the pipes and forms a combined condenser and cooling tower; for in its passage over the condenser pipes, evaporation takes place and the water is cooled as in a cooling tower provided an ample supply of fresh air is available.

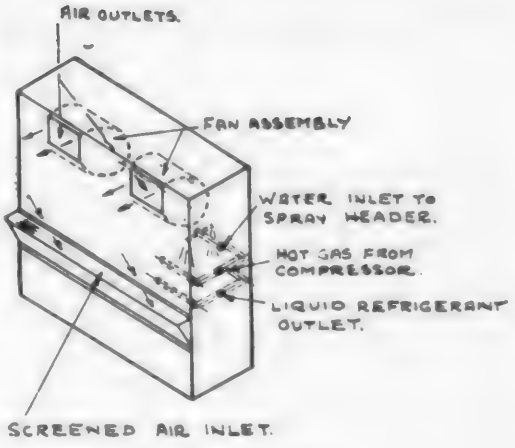



**Fig. 8.—Evaporative Condensers.**

Shell and tube condensers (vertical and horizontal) are similar in principle to the shell and tube coolers. A vertical shell and tube installation is shown in Fig. 7.

Evaporative condensers, shown in Fig. 8, cool the water supplied as a coolant for the refrigerant by evaporation. The method of operation is that air is drawn in at the bottom of the condenser, passes through water sprays and is discharged through a fan at the top of the condenser, cooling the water in its passage. The hot compressed refrigerant gas passes through coils and the body of

(*Continued on page* 361)

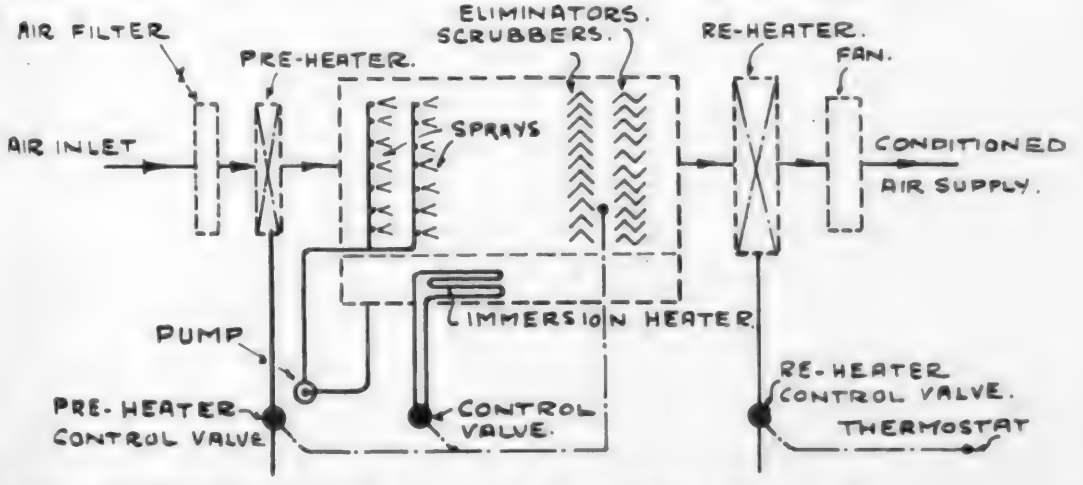



**Fig. 9.—Diagrammatic arrangement of air-washer for heating and humidification.**

# The Manufacture of Sausage Rusks

SPECIALLY CONTRIBUTED

THE average consumer of that much maligned victual, the sausage, attributes importance only to its meat content. It is true that it is the proportion and type of meat present which mainly determine the flavour, but the general quality of a sausage depends in no small measure upon the nature and treatment of the binder which it contains. The binder is usually a cooked cereal product and, although materials such as boiled rice have been employed, baked products prepared from flour find most favour. Specially prepared bread falls within this category, but the best sausage binders, although baked products prepared from flour, are not bread within the ordinary meaning of the term. Before these specially manufactured sausage rusks are discussed, however, brief reference must be made to the method by which sausage binders are prepared from ordinary bread.

### Salvaging Stale Bread

The plants devised for converting comparatively stale bread into a sausage binder consist essentially of four sections: a slicer, a drier, a grinder, and a grader. The loaves are fed into the slicing machine and the slices are then automatically conveyed into a section through which hot air is passed by means of a fan. The dried slices pass into the grinder from which they emerge in the form of a granular product of varying particle size. This material then passes over one or more sieves and the resulting graded products are bagged off. This type of process is suitable for salvaging stale bread by converting it into a useful sausage binder, but it does not represent the best method of producing first-class sausage rusks.

### Flour as Raw Material

The manufacture of the best sausage rusks starts not from stale bread but from flour, and usually a particular type of flour. The flour is made into a dough, which is subsequently baked, but various methods of preparing, aerating, and baking the dough are practised. The quality of the final rusks is considerably influenced by the technique employed for their preparation, and some manufacturers have found that they have been able to improve their rusks appreciably by the introduction of quite minor modifications into their technique. Thus, while it is a comparatively simple matter to manufacture a sausage rusk, the production of a first-class rusk is more difficult and demands skill and experience on the part of the operator and the closest supervision and control of each stage of the process. Before we turn our attention, however, to a more detailed discussion of the various processes by which rusks are manufactured, it is necessary to examine the factors which determine the quality of a rusk.

### Quality Criteria

The two main criteria by means of which the quality of a rusk is judged are water-absorbing capacity and colour. A sausage binder must naturally be capable of absorbing a considerable amount of water, but this in itself is not sufficient. The water must be absorbed with a thoroughness which leaves the material in such a state that it still feels dry and "sandy." If the application of a reasonable quantity of water yields a material which feels wet and "pappy," then the rusk is one of poor quality. A first-class rusk will absorb twice its own weight of water and remain dry and granular to the touch. In fact, the usual method of testing the water-absorbing capacity of a rusk is to add to it twice its weight of water and then to assess by touch its dryness and general physical nature.

### Good Colour an Important Factor

With respect to colour a good rusk should be white. This means that after baking the "crust" should be a light golden brown, and this colour should not extend to a great depth into the "biscuit." When this is so the particles of "crust" in the ground up material will not be sufficiently great in number or sufficiently deeply tinted to be markedly obtrusive. A rusk which exhibits numerous deeply coloured particles or shows a definite brownish tint is regarded as inferior. It will be appreciated, therefore, that where an increase in the water-absorbing power of a rusk is attempted through the medium of a more protracted baking period or of an elevated oven temperature, the value of any improvement in this direction may be annulled by too great a deterioration in the colour.

### Types of Dough

Rusks are made from each of the following types of dough: (*a*) A dough aerated by yeast; (*b*) a dough aerated by chemicals; (*c*) an unaerated dough.

Some of the best rusks on the pre-war market were made by method (*b*) or (*c*). The latter—*i.e.*, the unaerated dough method—gave excellent results, but it probably required the closest supervision, since the necessary "rise" in the biscuits had to be obtained solely by oven technique without the production of an unduly deep colour in the

goods. In the chemically aerated rusk, the necessary gas is produced by the incorporation in the dough of sodium bicarbonate and an acid ingredient. This latter is usually acid calcium phosphate or acid sodium pyrophosphate. The proportion of sodium bicarbonate employed varies, but is often between 1 and 2 lb. per sack (280 lb.) of flour. When A.C.P. of so-called "80 per cent. strength" is used as the acid body, the proportion needed is approximately 1½ times that of the sodium bicarbonate employed. When acid sodium pyrophosphate is used as the acid, recourse is usually had to a proprietary mixture containing about 65 per cent. of pyrophosphate. A diluted pyrophosphate of this nature needs to be employed at about double the rate of the sodium bicarbonate.

### Choice of Flour

Most manufacturers employing method (*b*) or (*c*) have found that the best results are obtained when a soft weak flour is used. In pre-war days Australian flour found favour for this work, although good results were also obtained with flour milled from good-quality English wheat. When English flour is used, however, it is essential that it shall have been milled from sound wheat. The flour yielded by native wheat which has undergone some degree of sprouting, a defect which is not uncommon in seasons characterised by a wet harvest period, is likely to be less satisfactory and, indeed, may prove to be quite unsuitable for the production of good rusks. Such flour is liable to have excessive saccharogenic and dextrinogenic powers, the direct result of which is a tendency towards impairment of both water-absorbing capacity and colour. Some manufacturers prefer a rather stronger flour than Australian or English and, in the past, have employed a mixture of equal parts of Australian and of straight-run bakers' flour. The degree of weakness which gives the best results will, of course, vary with the manufacturing technique employed, but for normal processes a really strong flour is unsuitable. The type of flour best suited to a given process can best be ascertained by direct experiment.

### Preparation of Dough

Although "dough" has been spoken of throughout this article, the flour-water mixture used in the manufacture of rusks is very different from a bread dough in consistency. The quantity of water used to produce a bread dough is in the region of 52 per cent. of the weight of the flour, whereas only about two-thirds of this amount of water is used for making sausage rusks. In other words, the amount of water used for a rusk dough is only about 35 per cent. of the weight of the flour, a proportion similar to that employed in the manufacture of hard biscuits. This means that to produce a dough suitable for the normal rusk-making process about 9½ to 10½ gallons of water are required for each sack (280 lb.) of flour. It is normal practice to include salt in the dough, although there is some variation in the proportions used by different manufacturers. The average salt content, however, is about 4 lb. per sack of flour.

The flour, salt, and water are mixed together mechanically until a "clear"—*i.e.*, a homogeneous—dough is obtained. Thorough mixing is essential, and it is necessary, therefore, that the mechanical mixer should be one which is designed to deal with these tight stiff doughs. The duration of the mixing is often 10 to 20 minutes, but it must be governed by the efficiency of the mixer, since mixing must continue until the dough is properly "cleared." The finished dough is then passed through rolls, known as reduction brakes, which transform it into a thin sheet and, at the same time, assist in attaining homogeneity. The sheet of dough coming from the brakes is passed through a cutting machine which divides it into pieces of the required size. Often the cut pieces are quite small—say, 1 to 1½ inches square—but in some factories the dough sheet is cut into large squares with a side of about 12 inches in length.

### The Baking Operation

The next operation in the process is the baking of the pieces of dough or "biscuits." This is an important operation in that it can influence both the water-absorbing capacity and the colour of the finished rusks. It is not, however, possible to lay down hard-and-fast rules for the baking operation, since the oven technique required for best results will depend upon the composition of the dough, the size and thickness of the biscuit, the type of oven, and the treatment the goods receive after leaving the oven. The two factors involved in the baking operation which can be varied independently are time and temperature, and the best combination of these two factors must be determined for each process by experiments conducted on the actual factory plant. The desirable aim is to effect a balance between the duration and the temperature of the baking operation which will enable a high water-absorbing capacity to be obtained without the development of too deep a colour. The scope for adjustment in this stage of the process is revealed by the fact that whereas some manufacturers employ an oven temperature of 380° F. many rusks are baked at a temperature of 450° F.

### Properties of Rusk

The water-absorbing power, and particularly the water-retaining power, of rusks is mainly governed by the colloidal properties of the flour constituents, but it is naturally influenced also by the moisture content of the final rusks. It is an advantage, therefore, to ensure that the finished rusk has a low moisture content. The extent to which drying out

can be accomplished during the baking process, however, is dependent upon the rate at which the biscuits assume a brown colour, and on some plants it has proved impossible to reach a satisfactorily low moisture content at the completion of the baking process without spoiling the colour. Difficulty in this direction can, of course, be overcome by arranging that the rusks leaving the oven pass to a drier, and this procedure is in operation in some factories. The temperature of the drier is sufficiently high to cause moisture to be evaporated from the rusks, but it is well below the level at which intensification of the colour would occur. It has also been found that if the rusks leaving the oven are not allowed to cool, but are passed to a bin in which their temperature is maintained for some hours, they will exhibit an improved water-absorbing power. This effect may be at least partially due to a further loss of moisture from the baked rusks during the period in which they are kept hot. The moisture content of good sausage rusks is usually about 10 per cent.

The baked biscuits are eventually ground up by means of rolls, which are usually fluted, and the resulting product is then sieved in order to separate the finer dusty material and any unusually large fragments.

It has been possible to indicate only the broad principles underlying the manufacture of sausage rusks; the finer details of technique must be established for each factory by experiments on the actual plant. The full procedure necessary for the production of a really good rusk having been settled, steps must be taken to ensure that each stage of the process is efficiently and understandingly controlled and supervised, since only in this way can consistency in the quality of the product be assured.

---

## Semi-Micro Analysis

THE first volume* of a new series, which it is proposed to issue dealing with modern analytical chemistry, has set a standard which it is hoped will be maintained. It is described as being a book of reference for experienced analysts and a textbook for students. For the latter purpose it is admirable, because, in clear language, it describes processes which the authors, specialists in this type of work, have found to be satisfactory, and gives a carefully selected number of references to original works or to textbooks for further information.

The busy analyst will be glad to have a small reference book giving a reliable method for the occasional determination of a number of elements and organic radicles, but he must appreciate that this is the aspect dealt with in this particular volume, and hope that the other members of the series will complete his requirements in other directions. Similarly, he must appreciate that this is a small book giving the authors' personal views with regard to methods. In some instances he may prefer his own reagents for oxidation, reduction, or precipitation, but in the reviewer's opinion this does not detract from the utility of the volume. Anyone making a large number of determinations of a particular type must consult the literature exhaustively and carry out individual research to perfect a technique for such particular analysis, but the proposition is entirely different when it is a matter of an individual determination, and he will be glad to have a clear-cut method without too much of the cookery book style, giving all relevant information.

It is in the matter of laboratory technique that the book is most useful, especially that section dealing with the care and use of the balance, which the authors modestly suggest may be ignored by those with experience. The thanks of chemists would be due to the authors for this alone, and, while the book as a whole should find a place on the library shelf, the reviewer takes the liberty to suggest that Chapter II should be reprinted as a pamphlet, which could be hung in balance-rooms for immediate reference when anything goes wrong with a weighing.

Finally, the publishers and printers may be congratulated on the general get-up of the volume, its modest price, and its freedom from printers' errors, considering that it was produced at a particularly trying time in the war period.—T. MCLACHLAN.

* *Semi-Micro Quantitative Organic Analysis.* By R. Belcher and A. L. Godbert. Pp. 168+viii. London. 10s. 6d. net.

---

## Food Rations in France

A FIGURE between 2,400 and 2,750 Calories for 24 hours for a person weighing about 143 lb. has been arrived at by Simonnet of the *Institut National d'Hygiène* in an attempt to establish the post-war food ration for the French. The theoretical ration for the French will be established at around 2,800 Calories, provided by 100 g. of proteins of vegetable and animal origin in equal parts, 420 g. of carbohydrates, and 60 to 80 g. of fats.

It is reported in the *Journal of the American Medical Association* (1945, **128**, 7) that Simonnet based his calculations on the general forms of human food allowance fixed by the League of Nations in 1936 and 1938. He adapted theory to certain realities such as the resources of the nation, former habits, climatic conditions, and nutritional needs created by the state of malnutrition due to the war. Nutrition and morbidity in various diseases and the needs of certain groups of the population were also considered.

The energy-producing needs correspond to the sum of several elements—the calorific needs of the basal metabolism, the specific dynamic action of the foods, thermoregulation, the muscular and digestive work, growth, and, in pregnant women and young mothers, the requirements of gestation and lactation. On the other hand, the environment in which the person lives, his present state of nutrition, age, sex, and muscular activity may modify the average figures. The specific dynamic action varies according to the nature of the foods ingested and according to their combination. Thermoregulation is influenced by the work, the clothing, and the external temperature. Muscular work and the requirements of growth vary greatly.

# Rebuilding Family Life

A NUMBER of eminent authorities have collaborated in the production of a book* containing enquiries into aspects of family life in the post-war world. In his prefatory note, the editor, Sir James Marchant, has pointed out that while they are united in a common purpose the authors have been free to express their personal convictions. Differences inevitably exist, but where they do, they are more in words than in principles.

There are eleven sections covering, among other aspects of the subject, nutrition, biology, health, psychology, education, and religion.

The authors have been given the difficult task of covering such complicated subjects in the few pages allotted to them. Sir John Boyd Orr writes on nutrition and the family in 9½ pages, and his article is a model of compression and clarity. The Government's acceptance of the primary responsibility of seeing that food sufficient for health is available for every family (in accordance with the recommendations of the United Nations Food and Agriculture Conference) will lead, considers Sir John, to a great promotion of the health and happiness of families.

Each chapter concludes with a set of recommendations which form a synopsis of the matters discussed. Among those made in the section above mentioned are (1) that the war food policy of production for consumption and distribution according to needs should be continued and production of the protective foods should be geared up to national consumption requirements; (2) public health schemes for free milk, cod-liver oil, and other vitamin-rich substances to mothers and children should be continued; (3) free school meals; (4) school meals should be used as object lessons to teach food values, etc.

The chapter on biology is written by Dr. F. A. E. Crew, Professor of Public Health and Social Medicine in the University of Edinburgh. He discusses reproduction, parental care, species survival and family grouping, the biological considerations of marriage, and many other biological aspects from the point of view of social development. One of the important conclusions come to by the author is that the biologist must watch with care and see to it that the biological foundation and the biological significance of the family are not forgotten when plans for the future, which indirectly affect the family, are being made.

Health and the family are discussed by Sir Arthur S. MacNalty. In his summary he points out that deplorable family conditions were the result of the industrial revolution and increasing urbanisation. The chief matters needing special action are the conquest of diphtheria, the juggernaut of careless motor driving, and the diseases specially inimical to family life: (*a*) tuberculosis; (*b*) venereal diseases; (*c*) rheumatic diseases; (*d*) alcoholism. The author is an advocate for the universal treatment of all milk.

Lord Horder in his introduction strongly commends this book to every thinking man and woman throughout the country who can help to fulfil its high aim—the rebuilding of a national family life on sure foundations after the stress and upheaval of six years of war. —T. C.-W.

* *Rebuilding Family Life in the Post-War World.* Edited by Sir James Marchant. Pp. 136. London. 2s.

# Air Conditioning in the Food Factory

(*Continued from page* 357)

the condenser, and by the combined action of spray water and large volume of air passing over the coil the hot gas is liquefied and cooled.

The economies effected by the use of this equipment consist of the continuous use of the water, the only supply required being that to make up for evaporation losses, instead of all the cooling water going to waste as it would otherwise do where there is insufficient space available for such bulky objects as cooling ponds, cooling towers, or atmospheric condensers.

### Heating and Humidification

A simple arrangement for heating and humidification is shown in Fig. 9. Examination of this will show that the plant comprises a preliminary heater battery, a series of sprays, a final heater, and a heating coil in the circulation water tank. In this method of operation advantage is taken of the fact that heating air increases its capacity to hold moisture, sufficient heat being added to it by the preheaters to cause it to become saturated at the desired dew-point temperature after passing through the heated spray water in the washer.

Provided this saturation temperature is controlled automatically by adjustment of the heat to the heating coils, the quantity of moisture in the delivery air to the conditioned space will be fixed.

A thermostat is fitted after the washer to control the heat supply to the coil in the spare water tank and to the preheater or tempering coils. The saturated air leaving the washer is then heated up by a re-heater to the desired final temperature; a thermostat in the conditioned space is arranged to control the heat to the re-heater and thus maintains the correct dry-bulb temperature under all conditions when heating is necessary.

Obviously, maximum efficiency is dependent upon the efficiency of the sprays to a very large extent, the finer the atomisation of the water the greater the saturation efficiency. This factor depends upon the design of the nozzles, the pressure at the sprays, and the number of spray-banks. It is good practice to supply about one half-pound of water per one pound of air with one bank of nozzles at a pressure of twenty to thirty pounds per square inch. Although the number of banks required for washing is dependent upon the temperature range through which the air must be altered, in a well-designed system saturation efficiencies can be considerably increased by the number of banks.

The eliminators ensure that no entrained moisture is carried over by the air stream, so that all the moisture contained in the air is in the form of saturated water vapour.

(*To be continued*)

# Grading Peas by Specific Gravity

THE process of sorting peas and beans and grading them by specific gravity is not new. In 1920 efforts were made to employ a brine solution for separation, but the early machines were crude and mechanically inefficient, and it was not until ten years later that a really successful machine was developed.

William H. Ames, of Markesan, Wisconsin, then made the discovery that if peas and beans were blanched before being subjected to a gravity separation in a brine solution, the results obtained were greatly improved. Food Machinery Corporation purchased the basic patent. In practice it was discovered that eddies and counter-currents sometimes caused hard peas to get mixed with tender ones, but recent improvements prevent this.

### The Lewis Machine

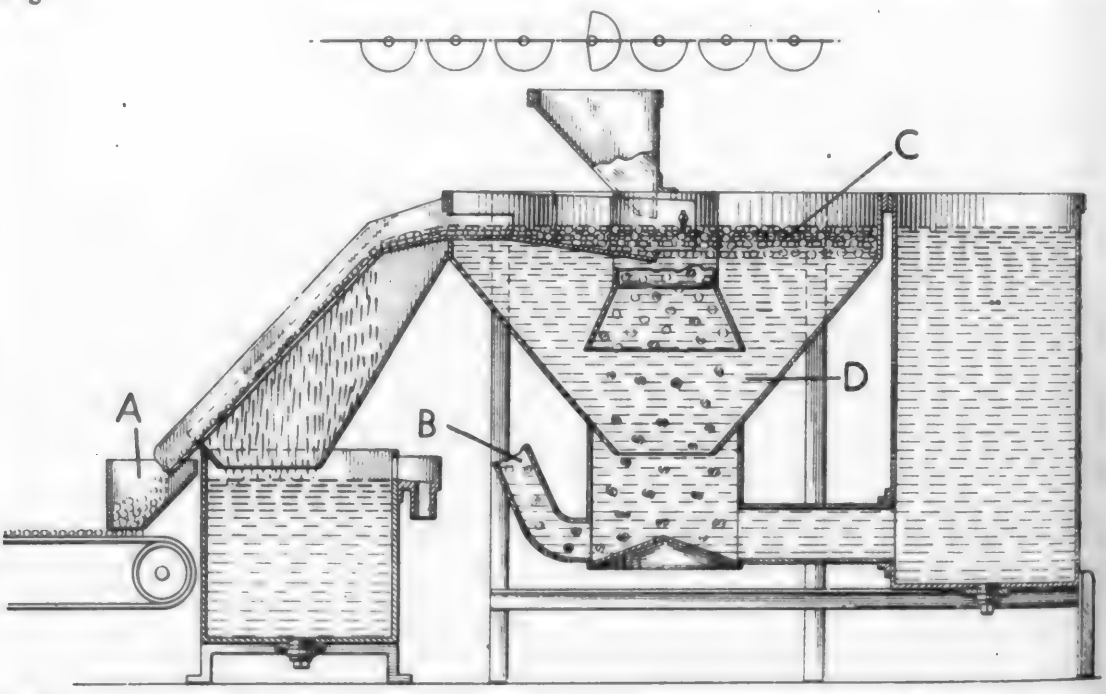
The new grader, known as the Lewis machine, includes a rotating cone in the centre of the machine to replace the former stationary one. The flow of brine through the machine causes this cone to revolve, and its effect is to avoid or break up the eddies and to prevent peas remaining in the machine longer than desirable.

**Fig. 1.—Diagram of the quality grader which takes two grades of peas from any given quantity and separates them by specific gravity, the "fancy" going through one outlet (A), and the too mature through another (B). At (C) tender peas are shown floating on top of the brine; (D), the too mature peas sinking.**

**Fig. 2.—Looking down on the top of the grader. Tender peas float in the brine and are carried off, more mature peas sinking to the bottom and being carried off by another outlet.**

**Fig. 3.—Front view of the Food Machinery Corporation pea grader. Peas enter through a feed hopper on top, which discharges below the surface of the brine. The circulating brine enters the separating tank through the bottom, and at a tangent, so as to cause the entire tankful of brine to whirl. As peas are admitted to the brine, the lighter ones quickly float to the surface and are carried around to the discharge point by the circular motion of the brine. The hard peas sink, are caught by the whirling brine and are discharged through an outlet in the bottom of the tank. The upward current effect enables the machine to separate peas in brine of a much lower density than other methods, resulting in a great saving of salt.**

Fig. 1.



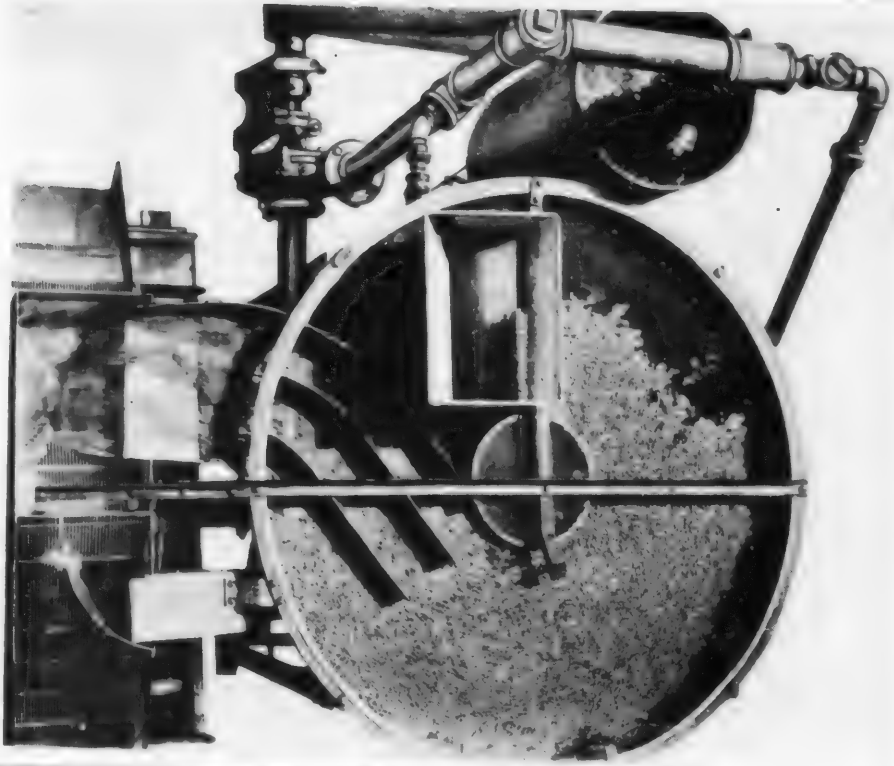


Fig. 2.

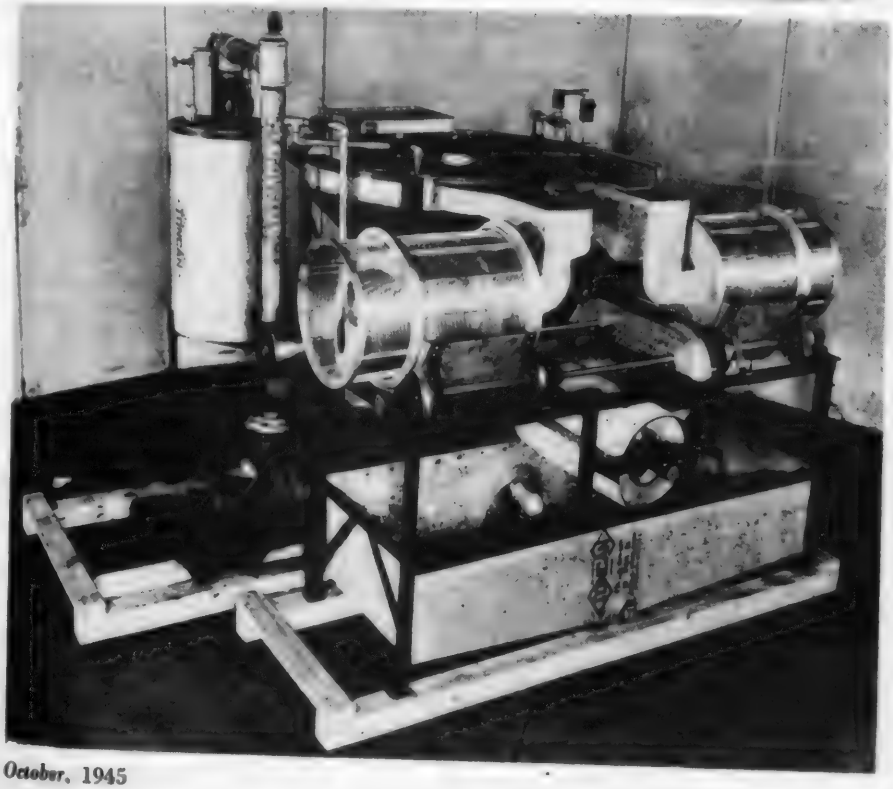


Fig. 3.

# The Complexities of Vitamin B

SPECIALLY CONTRIBUTED

AT a recent meeting of the Nutrition Society, a member was heard to remark, in jocular vein, that the description "vitamin B complex" should have its emphasis on the final word. Several distinct reasons for the extreme intricacy of this subject, which still provides headaches even for the specialist, may be plainly recognised. In the first place the complex is now known to consist of a dozen or more vitamins. Some of these are by now quite familiar substances, which have been synthesised by the organic chemist, and which are sold by the wholesale druggist with no more emotion than is occasioned by the sale of aspirin tablets or of Epsom salts. Other members of the group, however, are still only obtainable from their natural sources in the form of extracts, which are characterised by their biological action rather than by a knowledge of the chemical composition of the active principle. A second complicating factor is the wide variety of organisms which may require a particular vitamin. Thus a factor which is first found to be necessary for higher animals may later prove essential for bacteria, or even for the operation of artificial systems of enzyme extracts from which living cells have been removed. Thirdly, questions of nomenclature raise difficulties and anomalies which might have been minimised by more foresight and discussion in the earlier stages of research, but which are perhaps unavoidable in a field of investigation which has been developed so rapidly by isolated groups of workers in different parts of the world.

### Multiplicity of B Vitamins

Soon after the celebrated British scientist Sir F. G. Hopkins had given proof in 1912 of the existence of vitamins, or "accessory food factors" as they were then called, it was claimed by American workers that two factors were involved. These were designated "fat-soluble A" and "water-soluble B." It was subsequently recognised that the water-soluble anti-scurvy vitamin was distinct from vitamin B, and it was allotted the letter C. "Fat-soluble A" was next found to be commonly associated with the antirachitic vitamin D, and the "reproductive" vitamin E was later discovered in this group. The multiple nature of "water-soluble B," however, was not realised until 1928. Various workers, including Prof. R. A. Peters and Dr. Harriette Chick in this country, demonstrated that the biological properties of vitamin B concentrates were not uniform when they were tested in different ways. Thus fresh yeast was equally effective in curing nervous inco-ordination in pigeons, or promoting growth in young rats. If, however, the yeast was strongly heated before testing it was no longer effective in curing pigeons, although its value for rats was not entirely lost. It was concluded that a thermolabile factor, vitamin $B_1$, was responsible for the cure of nervous inco-ordination, while a thermostable vitamin $B_2$ had growth-promoting powers.

### Isolation of Riboflavin

The next advance came from an unexpected direction. German workers had been interested in a yellow strongly fluorescent substance which had been found in yeast and also in the whey of milk. A specimen of this pigment, now known as riboflavin, was isolated from milk and was found to promote growth in rats. For the moment it seemed that the story of "water-soluble B" had been completed. Riboflavin, however, did not entirely fill the role of vitamin $B_2$. Rats which were given a concentrate of vitamin $B_1$ together with riboflavin did not grow as well as others which were given whole yeast, and developed soreness and bleeding of the skin, particularly on their paws and round the mouth. Neither were pigeons completely satisfied, and the existence of several further members of the vitamin B complex was assumed. These were tentatively labelled $B_3$, $B_4$, $B_5$, $B_6$. The first three of these descriptions have now been virtually abandoned, either on account of insufficient evidence for the existence of the factors in question, or through revisions in nomenclature. Vitamin $B_6$, however, has been fully established as a factor preventing skin disease in rats.

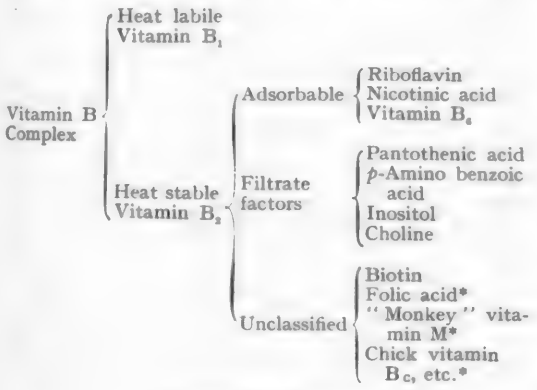
In spite of this rapid progress one vitally important gap in our knowledge of vitamin B had still to be filled. The human deficiency disease known as pellagra, of common occurrence in poorly fed communities subsisting largely on maize, failed to respond to therapy with any of the vitamins already mentioned. The alliterative syndromes dermatitis, diarrhoea, dementia, and death were found, however, to be cured or prevented by treatment with nicotinic acid, or the corresponding amide. The same substances also cured "black tongue," an analogous disease which can be produced in dogs by experimental methods. Rats can survive without the presence of this particular vitamin in their diet.

### Classification of B Vitamins

Most of the above advances, and others which cannot be described in a brief article, not only increased our knowledge of the vitamin B complex,

but introduced fresh complications and inconsistencies into the nomenclature. The situation was certainly not improved by the adoption of different names for the purified vitamins in England and America. Thus vitamin $B_1$, also called "aneurin" in England and "thiamin" in the U.S.A., is thermolabile, and the description covers a single vitamin. The term "vitamin $B_2$," on the other hand, represents a whole group of thermostable factors. Although at one time riboflavin was identified with vitamin $B_2$, this description was later discarded by most workers. Little is heard of vitamins $B_3$, $B_4$, and $B_5$, if indeed they exist, but $B_6$ survives as "adermin" in England and "pyridoxine" in America. After this point the numerical "suffix" system fell into disuse. Nicotinamide is described as such, or by the shortened American version "niacin." Another factor necessary for the growth of rats has been named pantothenic acid. Vitamin H was the label first given to a factor which prevents injury in rats when they are fed with raw egg white. Later, however, this vitamin was found to be identical with a component of "bios," an agent which accelerates the growth of yeast, and the name was changed to biotin.

In classifying the B vitamins a division may be made between those factors which are readily removed from their concentrates by absorption upon charcoal and others which are not adsorbed.




* Composition unknown.

### "Major" and "Minor" Vitamins

It is well known that cows and other ruminating animals do not require B vitamins in their diet, since these are synthesised by the bacteria of the rumen. To a lesser extent the bacteria of the intestines may contribute to the vitamin B requirements of non-ruminating animals, including man. Recently it has been suggested by Williams in America, with the concurrence of several workers in this country, that while some vitamins are directly required by the animal organism, the need for others is somewhat less specific. In so far as this theory concerns the vitamin B group, it is pointed out that deficiency of aneurin leads to polyneuritis or beri-beri, deficiency of riboflavin to a soreness of the corners of the mouth known as cheilosis, deficiency of adermin to a skin disease known as acrodynia, and deficiency of nicotinic acid to pellagra. These vitamins therefore have direct effects on the animal, and are classed as "major" vitamins. On the other hand the lesions produced in higher animals by deficiencies of pantothenic acid, *p*-aminobenzoic acid, inositol, choline, biotin, and folic acid are much less striking, and they are classed as "minor" vitamins. Since "minor" vitamins affect the animal only indirectly through their action on the intestinal bacteria, the term "secondary accessories" has been suggested by Harris and Kodicek. Although it is possible that our failure to observe characteristic symptoms in animals as a result of deficiency of the more recently recognised factors has been due merely to insufficient research, the proposed new classification is certainly attractive at the present stage of our knowledge.

### The Four "Major" B Vitamins

*Vitamin $B_1$* has the empirical formula $C_{12}H_{16}N_4OS$. Its structure, consisting of linked thiazole and pyrimidine rings, makes it something of a chemical curiosity. Its essential role in carbohydrate metabolism was discovered by Prof. Peters of Oxford, and later it was found that the pyrophosphate derivative of the vitamin is part of a co-enzyme to the carboxylase system. In this case, therefore, information which has been gained by the vitamin expert has been passed on to the biochemist interested in cell metabolism. In spite of its intricate chemical structure vitamin $B_1$ has been successfully synthesised on a factory scale, and is available in large amounts.

*Riboflavin*, $C_{17}H_{20}N_4O_6$, is an alloxazine derivative. It is an essential component of many dehydrogenase enzyme systems. In this case the enzyme biochemist has repaid the vitamin worker by bringing to light a substance which on further trial has been shown to have activity as a vitamin. Riboflavin has also been synthesised.

*Nicotinic Acid*, $C_6H_5NO_2$, is $\beta$-pyridine carboxylic acid, and is thus a simple oxidation product of nicotine. It is perhaps rather surprising that such a commonplace substance should act as a vitamin. Nicotinic acid was separated long ago as a by-product in attempts to isolate vitamin $B_1$, but its own biological importance was not at first realised. Later, however, it was found to be a co-enzyme concerned in alcoholic fermentation. Its identification with the anti-pellagra vitamin by its power to cure "black tongue" in dogs was due to Elvehjem of Wisconsin. In humans large doses of nicotinic acid often cause flushing of the face and tingling of the ears. While in normal subjects the symptoms pass off in an hour, the reaction in sensitive cases may be severe, even with low doses.

Nicotinamide has the same vitamin activity without this objectionable feature.

*Vitamin* $B_6$, $C_8H_{11}NO_3$, is closely related to nicotinic acid, being methyl-hydroxy-dihydroxymethyl pyridine. It acts as a co-enzyme in the decarboxylation of amino acids.

It will be noticed that all four of the "major" B vitamins play essential roles in enzyme systems, or in other words are concerned with various forms of fermentation. Vitamins $B_1$ and $B_6$ were discovered as vitamins and were then assigned roles in enzyme systems. Riboflavin and nicotinic acid, on the other hand, were first known by enzyme workers, and subsequently were found to act as vitamins.

### The "Minor" B Vitamins

*Pantothenic Acid*, $C_9H_{17}NO_5$, is a constituent of "bios," the hypothetical factor postulated by Wildiers in 1901 to be essential for the growth of certain yeasts. It is an amidic condensation product of the simple amino acid $\beta$-alanine with $\alpha\gamma$-dihydroxy-$\beta\beta$-dimethyl-propionic acid. It also stimulates the growth of bacteria. The fact that it prevents skin lesions in chicks suggests caution in drawing too rigid distinctions between "minor" and "major" vitamins.

*Biotin*, $C_{10}H_{16}N_2O_3S$, is another constituent of "bios" and is necessary for the growth of bacteria. It is a derivative of caproic acid with a complex ring system containing C, N, and S attached. Raw egg white contains a substance "avidin," which inactivates biotin, and when rats are fed on this material they must be given extra biotin to compensate for this effect.

p-*Amino Benzoic Acid* is a simple compound necessary for the growth of bacteria. The sulphonamide drugs act by interfering with the proper utilisation of this substance.

*Inositol*, $C_6H_{12}O_6$, is a hydrogenated derivative of hexahydrobenzene, and is a growth factor for yeasts and bacteria. It is closely related to phytic acid of brown bread, which is inositol hexaphosphate.

*Choline*, $C_5H_{14}O_2$, is a strongly basic substance, which rather resembles ammonium hydroxide in structure. In the animal it is necessary for preventing the undue accumulation of fat in the liver. Its "lipotrophic" properties are shared to some degree by inositol.

*Folic Acid*, so called because it was first extracted from spinach leaves, is essential for the growth of certain bacteria. It is necessary for rats whose intestinal bacteria have been inactivated by sulphonamide drugs. Probably it is related to vitamins $B_c$ and M, which prevent the occurrence of anaemia in chickens and monkeys respectively. There is a strong suspicion that all these factors may be derivatives of xanthopterin. This yellow pigment is present in the wings of the brimstone butterfly, and was studied 50 years ago by Hopkins long before its possible nutritional significance was realised.

### The Vitamin B Complex in Foods

Out of the mass of information which has been made available by the labours of scientists several points will be of special interest to the manufacturer of food products. He will realise, in the first place, that there are many more B vitamins than was at one time supposed. It follows, therefore, that many foodstuffs which were once considered of little or no value from the vitamin standpoint may come into prominence as sources of newly discovered factors. Thus beer and stout have long been known to be devoid of vitamin $B_1$, which adheres to the yeast and solid sediment which are discarded in clarifying the beverage. The clear sparkling fluid, however, is a good source of riboflavin and of nicotinic acid. In the same way it has been found that meat extracts, which were at one time ignored as a source of vitamins, may also have some value in supplying nicotinic acid. There must be growing suspicion that many familiar foods, which do not appear to be rich in vitamins according to present knowledge, may eventually be found to fill an important role in supplying the less well known members of the vitamin B group.

In food processing, the main point to be borne in mind is the vulnerability of vitamin $B_1$ to heat. The other members of the complex are generally more thermostable, although it would perhaps be premature to apply a finding which has been well established for riboflavin, nicotinic acid, and vitamin $B_6$ to some of the more obscure members of the complex. Since vitamin $B_1$ is readily available on a commercial scale, it is feasible that in certain types of processed foods the main damage due to heat should be corrected by subsequent fortification with this vitamin. The general problem of the fortification of foods to replace B vitamins which have been lost in the process of refinement, however, must become more difficult with the discovery of each new factor. Thus after the manufacturer has successfully restored vitamin $B_1$, riboflavin, and nicotinic acid to his product, he may still fall short of Nature's standards in regard to vitamin $B_6$, pantothenic acid, biotin, and folic acid. The relative virtues of fortification as opposed to the avoidance of the excessive refinement of foodstuffs, and the desirability of including all the lesser-known vitamins, can only be decided in the light of future research.

**TO AUTHORS**

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

# The Drying of Potatoes

## Part III

H. G. WAGER, R. G. TOMKINS, S. T. P. BRIGHTWELL, R. J. L. ALLEN and L. W. MAPSON

### THE DRIED PRODUCT

*(Continued)*

#### Loss of Ascorbic Acid during Reconstitution and Cooking

DURING reconstitution and cooking the content of ascorbic acid in potato strips falls greatly (Table 7), partly through leaching into the cooking water and partly through destruction. The amount of ascorbic acid leached out depends on the ratio of the weight of cooked strip to the weight of the cooking liquor, while the amount destroyed varies rather markedly with different stocks of potato. The reason for this difference between stocks is not clear.

After cooking by the method previously described, the ratio of weight of potato strip to weight of water was 1:1 to 1:1·5, and, under these conditions, the ascorbic acid retained by the cooked strips was about 15 to 35 per cent. of that present in the dried strips. During cooking 25 to 60 per cent. of the ascorbic acid was destroyed and 20 to 40 per cent. was leached into the cooking liquors. Since the weight of strips increased four- to five-fold during reconstitution and cooking, the concentration of ascorbic acid in the cooked strips was 3 to 9 per cent. of that in the dry strip. The ascorbic acid in the cooked strips varied from about 0·5 to 1·0 mg. up to 5 mg. per 100 g. at different seasons of the year, and was 10 to 20 per cent. of that in the peeled and trimmed tubers.

#### Effect of *p*H of Liquors

Potato strips which developed a grey colour after scalding were also grey when dried and gave a grey cooked product. If such strips were scalded in an acid solution and then cooked in an acid or neutral solution the colour was much improved. On the other hand, if they were cooked in an alkaline liquor (*p*H 7·5 to 8·5) the colour was very poor. Thus, to ensure a good coloured cooked product by means of scalding in acid solution, there had to be a sufficient carry-over of buffering power by the strips of potato from the scalding to the cooking liquor to control the *p*H of the cooking liquor at 6·5 to 7·0, even when alkaline tap water was used for cooking.

The *p*H of the cooked strips (estimated on a sludge made by grinding the strips in distilled water) did not influence the flavour until a sour taste was detectable at about *p*H 4·5 to 5·0, or, on the other hand, until an alkaline taste was noticed at *p*H 8·0 to 9·0.

The texture of reconstituted and cooked strips dried after scalding in an acid solution (*p*H 5·0 or less) was hard, and as the *p*H of the scalding liquor was made more alkaline the cooked strips became progressively softer until at *p*H 8·0 to 9·0 they were soft and mushy.

#### Effect of Sulphite on Culinary Quality

The addition of sodium sulphite to the scalding liquor did not affect the flavour of the cooked strips

TABLE 7.

RETENTION OF ASCORBIC ACID DURING COOKING.

Ascorbic acid is given as mg./100 g. of the material analysed and as a percentage of the content of an equivalent weight of dry strips.

| *Expt. No.* | *Ratio of Weight of Cooked Strip to Weight of Cooking Liquor.* | | *Ascorbic Acid.* | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | *Dry Strips.* | *Soaked Strips.* | *Soaking Liquor.* | *Cooked Strips.* | *Cooking Liquor.* | *Loss in Cooking.* |
| A645/31 | 1:1·8 | Mg./100 g. | 28 | 3·8 | 2·8 | 1·9 | 2·1 | |
| | | Percentage of dry | 100 | 46 | 65 | 23 | 42 | 35 |
| A645/31 | 1:0·29 | Mg./100 g. | 28 | 3·9 | 4·8 | 3·0 | 4·1 | |
| | | Percentage of dry | 100 | 45 | 58 | 45 | 17 | 38 |
| A653 | 1:1 | Mg./100 g. | 69 | 7·1 | 6·0 | 5·2 | 6·7 | |
| | | Percentage of dry | 100 | 40 | 57 | 35 | 45 | 20 |
| A649 | 1:2 | Mg./100 g. | 37 | 3·3 | 2·0 | 1·4 | 1·2 | |
| | | Percentage of dry | 100 | 38 | 45 | 16 | 25 | 59 |
| A681 | 1:1·1 | Mg./100 g. | 60 | 4·7 | 5·8 | 4·3 | 5·0 | |
| | | Percentage of dry | 100 | 32 | 62 | 30 | 35 | 35 |

until a concentration of 0·07 per cent. $Na_2SO_3$ was reached. At this concentration some people could detect the taste of sulphite in the cooked strips. Sulphite appears to have no effect on the texture of the strips, except in so far as it alters the *p*H of the scalding liquor.

The effect of scalding in liquor containing sulphite on the colour of potato strips is complex. As has been said above, strips scalded in alkaline liquor were of a poor colour, and this worsening of colour was noticed when the strips were scalded in high concentrations of $Na_2SO_3$ in unbuffered solutions. The *p*H of the liquor after scalding did not change much throughout the range of $Na_2SO_3$ concentration of 0·012 to 0·1 per cent., so that the marks for the colour of cooked strip after scalding in sulphite solution over this range can be compared. To show the effect of sulphite in the scalding liquor on the colour of cooked strips, the differences between the mark awarded by the tasting panel to water-scalded material and to that scalded in various concentrations of sulphite solution for all available experiments have been averaged and are set out below. (The figures in brackets are the number of comparisons.)

| Concentration of $Na_2SO_3$ | 0·012% | 0·025% | 0·05% | 0·1% |
|---|---|---|---|---|
| Average improvement in mark for colour | 0·05 (4) | 0·16 (10) | 0·06 (5) | 0·15 (4) |

The improvement in colour observed from the use of sulphite varied in different experiments, the maximum being 0·4 of a mark, while in some cases the colour was worse. It seems safe to infer that the use of sulphite generally results in but slight improvement in colour. This conclusion is supported by the fact that high concentrations of sulphite have only the same effect as low ones.

Sulphite may also affect the colour of the cooked strips by preventing the oxidative enzymic darkening (or " pinking ") of raw strips. The brownish-red pigment so formed turns grey during scalding and thus discolours the dried strips. This change in colour is unaffected by sulphite, and, unlike the stem end blackening pigment, the final grey compound (melanin?) is unaffected by a change in *p*H from 3·5 to 8·0.

### Seasonal Effects on Culinary Quality

Potatoes at all seasons of the year have been processed and dried satisfactorily. New potatoes tended to be a little too waxy when cooked after drying, but their flavour and colour were good. Mature early potatoes were a little less floury than most maincrop potatoes, but this was not objectionable and resulted in a firm strip with little tendency to mush during cooking. The colour of mature early potatoes was normally good.

The culinary quality of dried strips made from fully mature maincrop potatoes changed little until a late stage of storage. For example, samples from a series of some twenty stocks of potatoes of various varieties were dried before and after holding in store at +8° C. from November-December until the following July. As a result of this prolonged storage the colour of the dried and cooked strips deteriorated, the average decrease in mark for colour being 0·5, but individual stocks varied greatly. Presumably this worsening of colour is to be attributed to an increase in stem end blackening, since enzymic darkening was prevented by the use of sulphite at all stages. The change in flavour and texture of the cooked strips was not significant.

Potatoes after prolonged storage may require more careful processing than freshly dug potatoes, since some old stocks tend to darken very rapidly after cutting because of enzymic action. This seems to become more marked with increasing age of the tubers.

### Suitability of Varieties

All varieties of potato so far tested have been dried without difficulty to a good quality product, but the general suitability of stocks and varieties is not equal. In assessing suitability of stocks, the important factors are (*a*) dry matter content of the tubers, (*b*) size and shape of tubers, (*c*) culinary quality of the product, the major factor here being colour.

The proportion of dry matter in different stocks of potato varies greatly, the range found in these experiments during the last year being 17·7 to 30·7 per cent. During processing and scalding there was a loss of 15 to 25 per cent. of the dry matter present in the raw tubers, due to loss of starch and soluble material; hence the yield of scalded and dried strips from these stocks showed a similar percentage of variation. Variations within a variety may be considerable; for instance, in this work the dry matter contents of different stocks of King Edward potatoes during 1943 ranged from 17·7 to 25·7 per cent., the average being 20·6 per cent.

It is advantageous to use stocks with a high content of dry matter, because a higher yield is obtained for the evaporation of less water. A possible drawback to such a policy is that stocks with a very high dry matter content are liable to be too floury to process easily or to cook well after drying. There may therefore be an optimum dry matter content of stocks for drying, but this optimum is fairly high.

A second consideration in choosing stocks for drying is the size and shape of the tubers, since this influences trimming and peeling losses and so the yield of dried potato. On the whole, large tubers, tubers with shallow eyes, and tubers of a regular shape tend to have low peeling and trimming losses, and these factors may outweigh the

**Samples prepared in the laboratory are cooked and judged for quality.**

advantage of a tuber with a high dry matter content.

The culinary quality of different stocks when dried varies greatly, especially as regards colour. Flavour and texture vary less, and are unlikely to be so poor as to make any stock unacceptable. Some few stocks give rise to dried strips that are too floury to cook well, but this is rare.

The extent of the development of greyness in strips processed and cooked under standard conditions varies greatly, depending on variety, stock, and, to a less extent, on time of year. Some varieties, such as Doon Star and Majestic, are prone to blackening, and others such as King Edward are less liable to it. In all varieties stocks will be found that are of good and of poor quality. In spite of a considerable amount of published work, little is known about the conditions during growth that favour the development of blackening in tubers. There is considerable variation in the extent of development of greyness in different tubers of the same stock and in different parts of the same tuber, but these differences are reduced during processing and cooking and the strips become of a more or less uniform grey colour. The effect of time of year has been discussed above.

## PRODUCTION OF DRIED RICED POTATO

Fully cooked potatoes, mashed and then extruded through small holes, give a vermicelli-like material which can be dried on trays in a similar way to strips. Potato dried in this way is, after cooking, like ordinary riced potato; hence this term is also used to describe the dried product.

The potatoes were peeled and trimmed as for the production of strips; hence losses up to this point were similar for both products. The tubers were then cut into large pieces, as for domestic cooking, and fully cooked in steam or water. During cooking there is a loss of solid matter into the cooking liquor or the liquor dripping from the steaming potatoes, and this loss is about the same as when strips of potatoes were scalded. The average loss in several experiments during steam cooking was 1·4 g. per kg., and during cooking in water was 7·1 g. per kg. of raw potato. A comparable figure for scalding strips in steam is 0·7 g. per kg., and for scalding strips in water is about 10 g. per kg. of raw strips.

The cooked potato was mashed while hot and the mash extruded as threads on to trays. The layer of potato had to be thin, otherwise the individual

TABLE 8A.

THE AVERAGE WET WEIGHTS AND DRY MATTER CONTENTS AT ALL STAGES IN THE PREPARATION AND COOKING OF DRIED POTATO STRIPS AND DRIED RICED POTATO.

The figures are in grams and based on 1,000 g. of peeled and trimmed potato.

| | | *Processing with Water Scalding.* | *Processing with Steam Scalding.* | *Processing with Ricing.* |
|---|---|---|---|---|
| Raw potato (unpeeled) | Weight | 1,250 | As for water scalding | As for water scalding |
| | Dry matter | 262 | | |
| Peeled and trimmed potatoes | Weight | 1,000 | ,, | ,, |
| | Dry matter | 210 | ,, | |
| Washed strips. | Weight | 1,000 | ,, | Not cut into strips or washed |
| | Dry matter | 173 | ,, | |
| Washing liquor | Dry matter | 37* | ,, | |
| Scalded strips or cooked potato | Weight | 1,000 | 1,030 | 980 |
| | Dry matter | 165 | 172 | 203 |
| Scalding or cooking liquor | Dry matter | 8 | 0·8 | 7 |
| Dried potato | Weight | 175 | 183 | 215 |
| | Dry matter | 165 | 172 | 203 |
| Cooked potato | Weight | 790 | 820 | 1,075 |
| | Dry matter | 154 | 160 | 203 |
| Cooking liquor | Dry matter | 11 | 12 | No liquor |

* 27 g. of dry starch + 10 g. soluble matter.

threads ran together under their own weight during the earlier stage of drying, and the lumps so produced required a very long time to dry. Similarly, the threads could not be moved on the trays. The duration of drying depended on the thickness of the threads; with threads about 2 mm. in diameter this was not more than 1 to 1½ hours.

Average figures for the ascorbic acid retained by the cooked mashed potato were given in Tables 3 and 4. The addition of sulphite to the cooking liquor led to a slight increase in the amount of ascorbic acid retained by the mashed potato, but in either case some 80 per cent. of the ascorbic acid in the raw potato was found in the cooked and mashed potato. In these experiments the potatoes were cooked in water, and it is highly probable that cooking in steam would lead to a slightly greater retention of ascorbic acid in the mash.

### The Dried Product

Dried riced potato should be white or light yellow in colour and should have a matt surface. A glazed or shiny surface indicates free starch, and such a product is rather sticky or glutinous when cooked. Reconstitution and cooking were carried out by adding four parts by weight of boiling water to one of riced potato and keeping warm for five minutes. The cooked product should resemble fresh riced potato in colour and texture and have a mild potato flavour.

The colour of riced potato was influenced by

TABLE 8B.

THE AVERAGE ASCORBIC ACID CONTENTS AT ALL STAGES IN THE PREPARATION AND COOKING OF DRIED POTATO STRIPS AND DRIED RICED POTATO.

Ascorbic acid as a percentage of that in an equivalent weight of peeled and trimmed potato.

| | *Processing with Water Scalding.* | *Processing with Steam Scalding.* | *Processing with Ricing.* |
|---|---|---|---|
| Raw potato (unpeeled) | 125 | As for water scalding | As for water scalding |
| Peeled and trimmed potatoes | 100 | ,, | ,, |
| Washed strips | 90 | ,, | Not cut into strips |
| Lost in washing | | | |
| Scalded strips or cooked potato | 58 | 76 | 80 |
| Scalding or cooking liquor | 19 | 14 ? | ? |
| Destroyed in scalding or cooking | 13 | 0 ? | ? |
| Dried potato | 48 | 64 | 60 |
| Cooked potato | 12 | 16 | 53 |
| Cooking liquor | 19 | 24 | No cooking liquor |
| Destroyed in cooking | 17 | 24 | 7 |

*Notes on Tables 8A and 8B.*

1. A uniform distribution of dry matter (21 per cent.) and ascorbic acid throughout the tubers is assumed.
2. Loss of dry matter in cooking fresh potatoes in water is taken as 0·7 per cent. of fresh wt. With cooking in steam the loss is 0·1 per cent.
3. The reconstitution ratio for potato strips (cooked potato/dry potato) varies with the method of cooking from 3·5 to 5 per cent.; 4·5 per cent. is used in the table for strips. Riced potato takes up 4 times its weight of water.
4. Loss of dry matter in cooking dried strip varies with volume of cooking water and a value of 7 per cent. of dry weight is used.

$p$H and stock in a similar way to that of potato strips, but the degree of darkening of the cooked product was less than in strips made from the same stock. This was probably due to the cooked product being less alkaline through the use of less water (which was alkaline) both in scalding and especially in cooking (ratio of one of dried rice to four of water and one of dried strip to ten of water). With stocks liable to serious discoloration the $p$H can be controlled by the addition of buffer solution during mashing.

The retention of ascorbic acid by the dried riced potato was about 60 per cent. of that present in the raw potato (Tables 3 and 4). This is a similar amount to that retained by steam-scalded and dried strips in the group of comparable experiments (Table 4 D). As already suggested, steam cooking should cause a slightly increased retention of ascorbic acid in the mash and so of that in the dried product.

The addition of sodium sulphite to the water in which the potatoes were cooked led to only a slightly increased retention of ascorbic acid in the mash, and the ascorbic acid content of the dried riced potato was not affected (Table 4 D).

During the cooking of dried riced potato the loss of ascorbic acid is small. There is no leaching loss, and only a short cooking period at a comparatively low temperature is required. In one experiment 100 g. of dried riced potato containing 47 mg. of ascorbic acid gave when cooked 500 g. containing 40 mg. of ascorbic acid (8 mg. per 100 g. as analysed); this 7 mg. of ascorbic acid, or 15 per cent. of that present in the dried product, was lost during cooking. Since the average retention of ascorbic acid by dried riced potato is 60 per cent. of that in the raw peeled tubers, the cooked product retains about 50 to 55 per cent. of that in the raw peeled tubers.

### The Packing Density of Riced Potato

The packing density of riced potato is about 0·25 g. per ml., but can be increased by fragmentation. This breaks open the potato cells, liberating starch, so that the mash, on cooking, becomes progressively more sticky the more the material is fragmented. At the same time the reconstitution of the unbroken portions becomes worse, presumably because the free starch has the greater inhibitional force. Figures illustrating the relation between the density of dry riced potato and the texture after cooking are given below.

| *Condition.* | *Density. g./ml.* | *Mark for Texture.* |
|---|---|---|
| A. Unbroken .. .. .. | 0·3 | 3·1 |
| B. Partly broken by hand, fine particles removed .. .. | 0·53 | 2·9 |
| C. Broken in hammer mill, fine particles removed .. .. | 0·61 | 2·5 |
| D. Broken in hammer mill, including fine particles .. | 0·76 | 2·0 |

Although slight fragmentation led to an increase in stickiness (as shown by a lower mark for texture), the quality of the product was not seriously reduced until a density of 0·5 to 0·6 g. per ml. was reached. In this experiment fine particles were removed from B and C but were present in D. If this process were carried out by a crushing machine it would be desirable to screen off the fine particles (*cf.* C and D).

### SUMMARY OF LOSSES

To summarise the results given in this paper, a comprehensive balance sheet has been drawn up which shows the wet and dry weights of potato dried as strips or rice at all stages during processing and cooking (Table 8A). This allows direct comparison to be made of the magnitude of the loss or gain in water and the loss of dry matter occurring in the various methods of processing. The fate of the ascorbic acid in potato during processing, drying, and cooking is also given in a similar table (8B). The figures given in the table are not in all cases the average of those in the previous tables, but have been chosen to give what is considered the best estimate of the changes at each stage, so as to present a general overall picture of the changes during processing.

### Main Conclusions

The main conclusions with regard to losses of nutrients are as follows:

In addition to a loss of 15 to 35 per cent. during peeling and trimming, there is, during washing, scalding, drying, and cooking the dried strips, a loss of 30 per cent. of the dry matter of the peeled tubers if the strips are scalded in water and 25 per cent. if scalded in steam. The only loss of dry matter in the preparation and cooking of riced potato, besides that during peeling, is 3 per cent. which occurs in the cooking of the raw tubers; hence the loss is the same as in domestic cooking.

Cooked potato strips made from water-scalded and dried strips retain 10 to 15 per cent. of the ascorbic acid content of the raw peeled potato, while if made from strips scalded in steam they retain 15 to 20 per cent. Cooked, riced potato retains 55 per cent. of the ascorbic acid of the raw peeled potatoes, and thus approaches the retention of 60 to 80 per cent. found in normal domestic cooking.

*The work described above was carried out as part of the programme of the Food Investigation Board and is published by permission of the Department of Scientific and Industrial Research.*

*Low Temperature Station for Research in Biochemistry and Biophysics, University of Cambridge and Department of Scientific and Industrial Research.*

*Dunn Nutritional Laboratory, University of Cambridge and Medical Research Council.*

(*Continued on page* 375)

# Jam Manufacture

**PART V**

GEORGE RAUCH

MODERN scientific jam manufacture is based on the laws governing gel formation, sugar, pectin, and acid being the main factors responsible.

**Gel Formation**

It is extremely difficult to account for the behaviour of gels. The following is an endeavour to explain the formation of the sugar-pectin-acid gel: in an acid media pectin is negatively charged; the addition of sugar affects the pectin-water equilibrium, the de-stabilised pectin conglomerates and forms a network of fibres through the jelly. This structure is capable of supporting liquids. Diagram A shows the factors affecting the strength of the network.

The continuity of the pectin network and the denseness of its fibres are determined by the concentration of the pectin. The higher the concentration the denser the fibres and "knots" of the structure. The rigidity of the structure is affected by the sugar concentration and acidity. The higher the concentration of sugar the less water there is for the structure to support. Acid toughens the fibres of the network, but unduly high acidity affects their elasticity and results either in a tough jelly, or destroys the structure due to decomposition of the pectin, or to hydrolysis. Low acidity results in weak fibres, which are not capable of supporting the sugar syrup, and a slack jelly results.

It has been found that gel formation occurs only within a certain range of hydrogen-ion concentration, the optimum acidity figure for jams and jellies being *p*H 3. The gel strength falls slowly on decreasing and rapidly on increasing the *p*H value. Beyond *p*H 3·45 no jelly formation occurs at the usual soluble solid range. The optimum concentration of sugar is about 67·5 per cent.; it is, however, possible to make jellies, with a high content of pectin and acid, containing less than 60 per cent. of sugar. Too high a concentration of sugar results also in a jam of sticky consistency. The quantity of pectin necessary to form a gel depends largely on the quality of the pectin. One per cent. should be sufficient to produce a firm jelly.

Pectin is of low stability. Alkalies destroy it even in the cold; acid in weak concentrations affects it under the influence of heat. High temperature alone splits the pectin molecule, which invariably results in the reduction of its setting power. Sulphur dioxide, used in the usual concentration, does not affect the setting power, while benzoate of soda sets free sodium hydroxide which destroys the pectin. Ferments and enzymes change during the ripening process pectose into pectin, and subsequently into pectinic and pectic acid; of these substances only pectin has jellifying properties. It is therefore obvious that overripe or fermented fruit is useless for pectin manufacture.

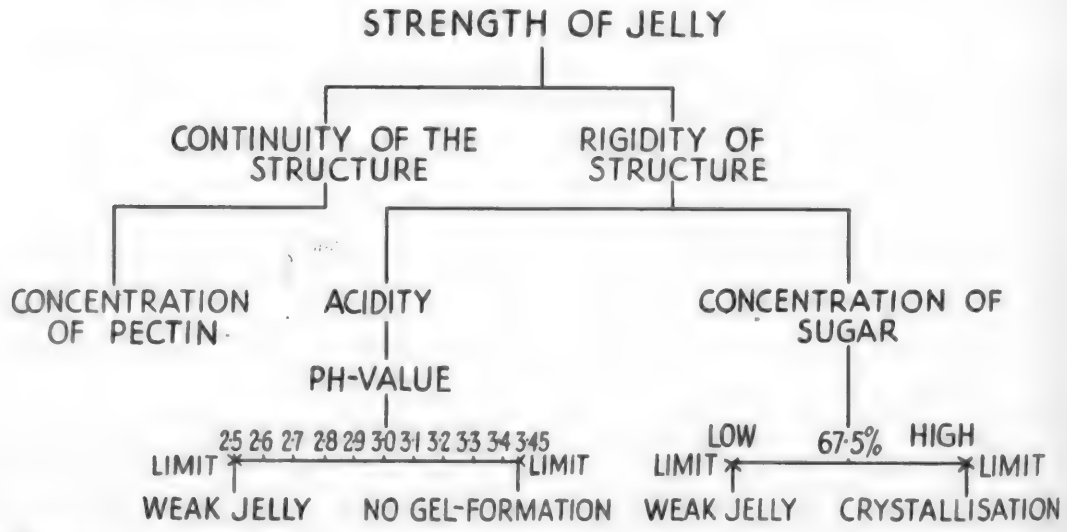
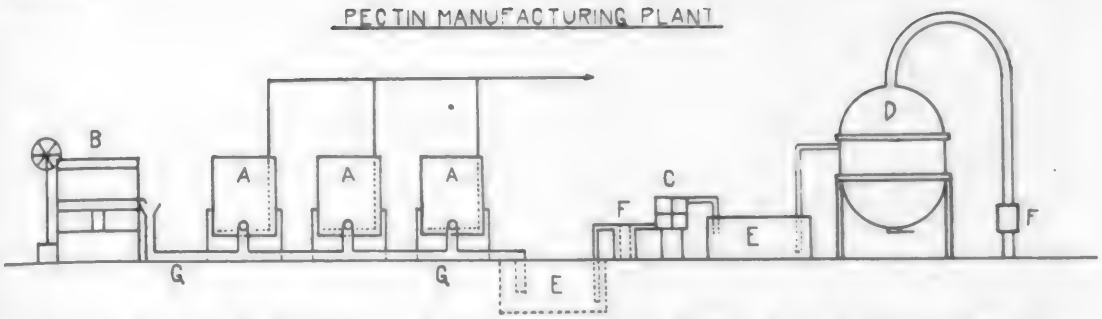



**Diagram A**

Diagram B.




**A—Steaming Barrels. B—Fruit Press. C—Filter. D—Vacuum Boiling Pan. E—Reception Tanks. F—Pumps. G—Pipe-Line.**

### Pectin Manufacture

In this country apples are mostly used for the manufacture of pectin. In California and Italy it is frequently produced from the pith of citrus fruit peel. It is possible to extract pectin from apples without the assistance of reagents, so that the pectin molecule remains undamaged. It is different with citrus pectin, as the bitter taste associated with the extract has to be removed by a chemical process which destroys the arabans almost entirely. Apple pectin consists of about one-third of arabans; citrus pectin contains practically none. For this reason citrus pectin jellies are usually tougher.

The manufacture of pectin of uniform quality and stable consistency is not simple, as different fruit varieties vary in their pectin content. It varies also at different stages of ripeness or due to different growing conditions. The manufacturing process is usually as follows: according to the nature of the raw material, the fruit or press residues are boiled in water with dilute acids, frequently under pressure, subsequently pressed, filtered, decolorised, and finally concentrated in vacuum pans. The final product is a neutral-tasting extract containing approximately 3 to 5 per cent. pectin. Pectin is also manufactured in powder form, which is produced by precipitation from the liquid extract, the precipitate being dried and ground.

### Manufacture of Pectin Extract in the Jam Factory

Some jam factories produce their own pectin extract as a by-product. This is a good proposition if waste material—as, for instance, press residues from apples, gooseberries, or red currants—is available. Windfalls or cider apples are equally suitable for pectin manufacture.

Press residues can be used either fresh, dried, or preserved with $SO_2$. Diagram B shows a simple improvised plant for the manufacture of pectin on a small scale. The main item is a specially adapted steaming barrel (A), made of oak or well-seasoned pine, fitted with a perforated steam coil, and having a tipping arrangement similar to a jam pan. The barrel has one outlet, which is covered on the inside with a fine metal gauze acting as a strainer. Other items are a fruit press (B), filters (C), and finally a vacuum pan (D). Filters working with compressed air are of great advantage, but if no such facilities are available, sugar bags nailed on frames may be used for filtration.

When made from residues, these are loaded into the steaming barrels with double their quantity of water. It is advisable, but not absolutely necessary, to leave the residues to soak for several hours. After soaking, 50 to 100 g. of tartaric acid per cwt. of material is added, and the whole boiled for 30 minutes. The mixture must not be transformed into a pulp, otherwise pressing and filtration will be difficult.

After boiling, the juice is drained off, mixed with 0·4 to 0·6 per cent. of decolorising carbon, and filtered while still hot. The filtered juice is kept in a separate cask or tank, and the remaining material poured into a bogie or other container, pressed, and subsequently filtered with decolorising carbon. A third extraction of the material in an autoclave under pressure yields still more pectin, but is not economical when working on a small scale.

After filtration, both juices are mixed and concentrated to one-fifth of their volume in a vacuum pan. The finished product is usually a brown-coloured viscous extract with a pectin content of about 3 or 4 per cent. The extract can be preserved in the usual way with $SO_2$. If cloudy, it will settle on standing for a period of 5 to 6 weeks.

If fresh green apples are used as the raw material, they should be sliced on a cutting machine and subsequently pressed. The fresh juice is filtered and kept separate in order to be mixed with juices produced by heat extraction. The press residue is treated in the same way as described before.

**Vacuum Boiling Pan in "Tira" Factory, Prague.**

### Grading of Pectin

The value of pectin solutions and extracts can be expressed in different ways. Carré and Haynes devised (1922) a method of expressing the pectin value based on calcium pectate. This figure shows only the quantity of pectinic acid, and does not take into account the methoxyl groups and arabans. The methods of determination devised by Fellenberg or by Zeisel are of little practical value in the jam factory. More suitable for practical purposes is the precipitation test with alcohol or acetone. Thirty ml. of pectin solution is mixed with 10 ml. of alcohol of 95 per cent. strength. The beaker with the mixture is placed in melting ice. Pectin of good quality should produce a firm jelly within one hour. Inferior pectin produces jellies of semi-liquid or weak consistency. If liquid pectin extract is tested, no addition of acid is necessary, but powdered pectin requires an addition of 0·8 to 1 per cent. of tartaric or lactic acid. The viscosity of a pectin solution is another indication of its setting properties.

### Gel-forming Properties

The properties of pectin are expressed in "grades," which indicates the number of pounds of sugar one pound of pectin will form a gel subject to certain specified conditions. The determination of the pectin grade is usually done by hand. A jelly produced from the pectin to be graded is tested against one made from a standard pectin sample. Experienced testers attain a high degree of proficiency. Several testing instruments, based on different principles, have been devised to replace the somewhat unreliable subjective testing. An interesting method, based on the percentage of sag occurring when a test jelly is removed from its container and placed upon a glass plate, was described by Cox and Highby in FOOD MANUFACTURE, June, 1944, page 199.

### The Use of Pectin

Some fruits do not require additional pectin; in others the quantity of pectin necessary to form a jam or jelly of commercial consistency is dependent on several factors, as, for instance, the quality and quantity of the natural pectin content, the nature of the recipe, the content of soluble solids in the finished product, etc. Apples, damsons, currants, gooseberries, lemons, limes, plums, and quinces are of high pectin strength, while cherries, figs, peaches, pears, pineapples, and rhubarb have a low content. Strawberries and raspberries show fairly high average figures, but their pectin is of low grade. The table below shows the average content of pectin in different fruit varieties, as found by T. Macara:

| *Fruit Variety.* | *Pectin Content, as Crude Calcium Average Percentage Pectate.* |
|---|---|
| Gooseberries | 0·81 |
| Red currants | 0·58 |
| Victoria plums | 0·82 |
| Red and blue plums | 0·82 |
| Apples | 0·75 |
| Black currants | 1·08 |
| Strawberries | 0·53 |
| Raspberries | 0·53 |
| Cherries | 0·24 |
| Greengages | 0·95 |
| Green and golden plums | 0·80 |
| Blackberries | 0·59 |
| Damsons | 1·15 |

To obtain the uniform jelly consistency of jams, jellies, and marmalade, it is necessary to adjust their pectin content to the requirements of the trade, and make up the natural deficiency by addition of commercial pectin. Such an addition is quite legitimate, as pectin occurs naturally in fruits, and there can be no more objection against its reasonable use than against the addition of sugar. Furthermore, it is of dietetic and nutritive value; it stimulates the saliva, and assists the peristaltic movements of the intestines. Edward C. Schneider found that 79 to 84·5 per cent. of hemicellulose is digested. There are also purely technical reasons supporting the use of pectin—the reduction of the boiling time, which in turn assists in preserving volatile substances and prevents the excessive inversion of sugar.

At a soluble solid range of 70 per cent., the quantity of added pectin extract (3 to 4 per cent.

calcium pectate) varies between 5 to 12 lb. per 100 lb. of finished jam or jelly. It should always be added at the end of the boiling process, as excessive heat destroys its jellifying properties.

### Legal Regulations

The pre-war regulations stipulated that no pectin could be used in "National Mark" preserves. At present it is permitted under F.M.F. schedule in Full Fruit Standard Jams. "Lower Fruit Standard" Jams must be labelled as "with other fruit juice" if pectin is used.

BIBLIOGRAPHY

*Die Bestimmungsmethodik gelierkräftiger Pektinstoffe*, Dr. Alfred Mehlitz, Serger and Hempel.

Dr. R. Sucháripa, *Die Pektinstoffe*, Serger and Hempel.

T. Macara, "The composition of fruits as used for jam manufacture in Great Britain," *The Analyst*, January, 1931, vol. lvi, No. 658, p. 43.

# New Issues of Capital

THERE is a certain Government oversight, through the Treasury *via* the Capital Issues Committee, on new issues of capital.

Issues in connexion with certain trades and industries are given priority over the general run of business. There are nine classes of trades, each class having equal priority, although the Committee is enjoined to give specially sympathetic consideration to undertakings producing or selling for export; to issues designed to establish, restart, or convert or expand undertakings in the Development Areas; to undertakings which have been working under a Concentration of Industry scheme (or requisitioned); and to undertakings which have been war-damaged.

### Production of Raw Material

Other priorities concern issues for the production and exploitation of raw materials (term includes primary products of the soil, mines, and quarries); for the development of agricultural land and buildings and the fishing industry; issues by public utility undertakings and housing associations; for transport and storage; issues notified to the Committee by the Treasury (*e.g.*, in connexion with housing programmes, manufacture of household furnishing items, of personal clothing and footwear, of capital goods, particularly if needed to restart and re-equip industry, issues for the manufacture of consumable goods considered essential by a Government department, special consideration to be given to issues promoting manufacture in replacement of imports); and issues in relation to the catering industry, including hotels.

Ordinarily consent is given to issues for the renewal of obligations maturing on a definite date and to optional conversions if the conditions of the market permit.

Consent will usually be given where the object is to avoid bankruptcy or the loss of existing capital, providing that the amount required is reasonable, and apart from the priorities mentioned earlier, issues may be permitted for financing domestic distributive trades and retail trade if considered desirable for the maintenance of essential food supplies and other supplies and services considered necessary for the well-being of the nation.

If the issue, public or private, is £100,000 or more, agreement with the Bank of England (acting for the Treasury) will be necessary as to the time of making the issue.

Permission may be given for issues to carry out proposals for the acquisition, amalgamation, or absorption of existing industrial undertakings—that is, if there are special circumstances, as, for instance, where the death or retirement of the owner involves the withdrawal of his capital, wholly or in part, or where the object is one coming within the priorities mentioned but the present owner is not in a position to provide or secure additional capital necessary for the maintenance or improvement of the concern or to take advantage of a reasonable opportunity of expansion.

It should be understood that the foregoing notwithstanding, consent is not required to the raising of £50,000 in any one year, this limit having until recently been £10,000.

# The Drying of Potatoes—Part III

(*Continued from page* 371)

REFERENCES

[1] Analytical Sanitary Commission, *Lancet*, 1852, I, 295.
[2] Anonymous, *Med. Surg. Hist.*, British Army, Crimea, 1854-56, Vol. II, Pt. I, Sec. VII, p. 171. London: Harrison and Sons, 1858.
[3] Anonymous, *Food Industr.*, 1943, **15**, 47.
[4] Bukin and Povolotskaya, *Trudy priklad. Botan., Genet., Selekts.*, 1934, Prilozh., **67**, 179.
[5] Harris, Mapson and Wang, *Biochem. J.*, 1942, **36**, 155.
[6] Harris and Olliver, *Biochem J.*, 1932, **26**, 2067.
[7] Howe, *Ind. Eng. Chem.*, 1943, **35**, 24.
[8] Kröner and Lamel, *Vitamine u. Hormone*, 1941, **1**, 282 (abs. in *Z. unters. Lebensm.*, 1942, **84**, 275).
[9] Mapson, *Biochem. J.*, 1942, **36**, 196.
[10] Monier-Williams, *Min. Hlth. Rep. Pub. Hlth. Med. Subjects*, 1927, No. 43.
[11] Nichols, Powers, Gross and Noel, *U.S. Dept. Ag., Dept. Bull.*, 1335, 1925.
[12] Ranganathan, *Indian J. Med. Res.*, 1942, **30**, 517.
[13] Scheunert and Reschke, *Hausw. Jahrb. Lfg.*, 1941, **2**, 69.
[14] Smart, *Med. Surg. Hist. War of Rebellion*, Vol. I, Pt. III, Chap. 8, Washington, D.C., Gov. Printing Office, 1888.
[15] Zilva and Barker, *Dep. Sci. Industr. Res.*, London,
[16] Smith and Gillies, *Biochem. J.*, 1940, **34**, 1312.
[17] Smith and Paterson, *Biochem. J.*, 1937, **31**, 1992. *Rep. Food Invest. Bd.*, 1938, p. 201.
[18] Allen, Barker and Mapson, *J.S.C.I.*, 1943, **62**, 145.

ERRATUM

The reference Zilva and Barker[15] on page 325 of the September issue of FOOD MANUFACTURE should read Zilva and Barker[16].

# Trade News

## WORLD HUNGER

B. STROSS, M.Sc., M.B., Ch.B., M.P.

The world has always been hungry. Before the war two people out of every three had insufficient food. The results in terms of premature death and preventable disease make the extermination of Hiroshima by atomic bombing pale into insignificance. The solution of the problem of world hunger is not simple, and no full remedy is possible except by world planning. Four aspects of the problem are obvious. Firstly, the world must grow more food. Secondly, importing countries must produce more for themselves. Thirdly, exporting countries must have more regard to the needs of their own populations before they export their own food. Lastly, scientific methods need to be fully applied to agriculture all the world over. If we wish to improve and preserve our own civilisation we must solve this problem or suffer the fate of all previous empires.

---

### Parcel Post Service to France

The Postmaster-General announces that the parcel post service to France has been restored.

The rates of postage are as follows:

| 2 lb. | 3 lb. | 7 lb. | 11 lb. | 22 lb. |
|---|---|---|---|---|
| 2s. | 3s. | 3s. | 4s. | 6s. 6d. |

Parcels may not be registered or insured, or accepted for the Express Delivery or the Cash on Delivery services, and payment of Customs charges, if any, cannot be undertaken by the sender.

Senders must comply with the Censorship Permit, Export Licensing, and Currency Control regulations.

---

### Allied Bakeries, Ltd.

Referring to a paragraph in FOOD MANUFACTURE, September, Messrs. Allied Bakeries write as follows:

"The title of 'Allied Bakeries, Ltd.,' still remains as heretofore, but the laboratories, formerly a department of the subsidiary company of W. J. Barton, Ltd., are now known as the Laboratories and Technical Services department of Allied Bakeries, Ltd., as a whole, and as such function for all the member companies of the organisation."

## OBITER DICTA

- The censors and the conquerors depart; the piques and queues remain.—*Alison Settle.*
- So far as Dr. Summerskill and I are concerned we shall do our damnedest to see that we keep the larder as well stocked as possible.—*Sir Ben Smith.*
- If there are any rabbits to come out of the hat they will be the same sort of rabbits as Mr. Hudson's.—*Mr. Tom Williams, Minister of Agriculture.*
- Pre-war diet consisted of fish and chips, beer, bread and cheese, roast beef and Yorkshire pudding; but now they get the same dehydrated muck as anyone else.—*An S.Q.M.S. of the R.A.M.C.*
- To assist him as Parliamentary Secretary, the Minister of Food has Dr. Edith Summerskill, a lady whose statements on the Brains Trust with regard to the value of meat in the diet may cause some misgiving.—*Meat Trades' Journal.*
- If the Service people are to come back permanently to their old jobs, which we sincerely hope they will do, it will be imperative for the new Government to establish a high order of priority for the rebuilding of shops and factories.—*Lord Trent.*
- After butchers and butchers' ladies have had to divide fat sides of pork into 1s. 2d. rations there is no need to wonder at the scientists' discovery how to split the atom.—*Alderman C. W. Hewson, J.P., President of the National Federation.*
- It would be a great mistake to think that all you have to do to improve the procedure of the House is to make it able to turn out the largest number of Bills in the shortest amount of time. That is all right if you are working in a sausage factory.—*Mr. Winston Churchill.*
- American troops in this country have not been allowed to drink milk unless it was *both from tuberculin-tested herds and had been pasteurised*; yet, so far from insisting on the double protection, we do not even make universal the simpler of the two expedients.—*British Medical Journal.*

### B.E.T.R.O. Appoints Public Relations Officer

Commander Philip Baker, O.B.E., R.N.(Ret.), has been appointed Public Relations Officer to the British Export Trade Research Organisation. In a statement to the Press Commander Baker said that everyone should know that the export trade is most important to the welfare of the British citizen. Without the overseas credits built up by selling our products we cannot buy imports, and the consumer will not win a plentiful supply of the world's goods. Nowhere is this more important than in Great Britain, where so much of our imports goes into producing manufactured goods.

Market research is such a new science that few people, even in industry, really understand what it means or how it can help them. Widely speaking, it means finding out the facts about the peculiar tastes of people who live, think, and act differently from us.

Membership of B.E.T.R.O. is open to any British firm, large or small, who has the perception to see that market research is essential to their sales policy, if they are to compete with America, which is far from backward in the exploitation of this new science. The work of B.E.T.R.O. should be of special appeal to the thousands of smaller manufacturers entering the export market, who have not had the worldwide experience of their bigger brothers.

---

### Industrial Law for Executives

The Industrial Welfare Society's Correspondence Course in Industrial Law has proved of great benefit to a large number of persons who have been drafted into executive positions in industry and who required a working knowledge of industrial law, but who could not afford to give a prolonged study to the subject. The course consists of six lectures, each of which can be read in 1 to 1½ hours, and students are invited to submit any questions they wish on the lectures. The lectures are normally sent weekly, but they can be sent all at once or at longer intervals at the wish of the individual student. Particulars can be obtained on application to the Secretary, Industrial Welfare Society, 14, Hobart Place, London, S.W.1

---

### Change of Name

E. Harriott and Co., Ltd., manufacturers of packaging for the food industry, have changed their name to Box-Carton, Ltd.

### Food Education Society

A public lecture on "Food and Maternal Morbidity and Mortality" is to be given by Dame Louise McIlroy, D.B.E., LL.D., M.D., D.Sc., on October 15, 1945, at London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C. 1.

### Change of Address

George Ellison, Ltd., Victor Buildings, 15, New Bridge Street, Newcastle-on-Tyne, 1. Previously the postal number was 2. The change has been made by the postal authorities in an effort to speed up the delivery of mail.

### Salvage Still Wanted

To re-establish our peacetime economy Britain will still need the fullest possible collections of certain types of waste materials—waste paper, bones, rags, and kitchen waste. Mr. John Wilmot, Minister of Supply and Aircraft Production, in a message to local authorities, which expresses the thanks of the Government for their great help throughout the war in the supply of essential materials, says:

"I desire, as Minister of Supply, to express the thanks of the Government for the very great help which local authorities have given throughout the war in the supply of essential materials by means of their salvage schemes.

"I must, however, emphasise that the work is not yet complete. The need is as vital and as great now as it has ever been, and to re-establish our peacetime economy we still need the fullest possible collections of certain types of waste materials—waste paper, bones, rags, and kitchen waste. I recognise only too well the difficulties with which local authorities and their staffs are still beset, and I and my colleagues will do everything we can to help in these difficulties, and to secure the necessary increases in labour where it can be made available.

"I do therefore appeal for your continued efforts and enthusiasm."

# Society of Chemical Industry

## FOOD GROUP SUMMER MEETING

**Some members of the Food Group at Welwyn Garden City.**

The Food Group of the Society of Chemical Industry got off to a fine start on the occasion of their first post-war summer meeting at Welwyn Garden City on September 7. Some 120 members met at the Roche Products factory in the morning and were immediately conducted on a tour of the Research and Pharmaceutical Departments. Among a large number of items of outstanding interest was the experimental penicillin production unit, and a demonstration of the methods of assay. Another demonstration which attracted much attention was the test on human subjects concerned with the effect of the factor (vitamin P) that decreases capillary fragility.

An interesting description was that of a synthesis of vitamin $B_6$ (pyridoxin), and samples of the intermediate products were exhibited.

After lunch, two short talks were given in the ballroom of the Cherry Tree Hotel. Dr. R. R. Ridgway gave a general description of the large-scale synthesis of vitamins as carried out in the Roche factory, which was useful during the subsequent tour of the different departments. A survey of the present state of opinion on the fortification of foods with vitamins was given by Dr. J. H. Harrison, and the subject was illustrated by a display of foods thus fortified.

The guests were then conducted through the factory where they witnessed the large-scale manufacture of vitamins, after which they partook of tea in the company's canteen. After tea, Mr. T. Rendle, chairman of the Food Group, speaking on its behalf, paid a tribute to Roche Products, Ltd., for the way the party had been received and for the trouble they had taken in making the trip a most pleasant and instructive one.

Dr. Cullen in a short and entertaining speech seconded Mr. Rendle, and Mr. H. J. W. France, managing director, Roche Products, Ltd., responded on behalf of the company.

One of the features of the visit was the extraordinary efficiency of the arrangements made by those concerned at the factory. Thanks are also due to the leaders of the different groups into which the company had been divided. Theirs was an arduous task, well fulfilled, and their dissertations on the intricate processes were models of clarity.

**Some more members of the Food Group.**

# Company News

### Mr. T. P. Ward

Mr. T. P. Ward, A.M.I.Mech.E., associated for a number of years with George Cohen, Sons and Co., Ltd., as manager of the Chemical Plant Section, has resigned his position in order to take up that of managing director of Morton, Son and Ward, Ltd., Chemical and General Engineers, Dobcross, near Oldham, Lancs., who are engaged in the reconditioning and distribution of chemical and all types of plant and machinery.

### I.C.A.'s New President

Mr. Anthony Facchino has been elected the new President of the Ice Cream Alliance in succession to Mr. W. A. J. Osborne. Mr. Facchino was deputy chairman of the Executive Council last year, chairman of the Publicity Committee, and of the Midland Division.

Under the bye-laws of the association, which were approved at a general meeting of the Alliance in London recently, Mr. W. A. J. Osborne became vice-president for the current year. Members of the Executive Council are elected by the Divisions throughout the country.

### Apple Book

A revised edition of Dr. H. V. Taylor's standard work *The Apples of England* (21s.) has been published. Several new varieties are introduced and some of the old and inferior sorts taken out. There is an excellent chapter on the development of British varieties and a descriptive table of sizes, shapes, and seasons for easy identification. A first-rate reference book for apple people, though it is to be hoped that future editions might have illustrations in colour.

### New Luncheon Club

Formed to function on lines similar to the London Fuel Luncheon Club, the North-Western Fuel Luncheon Club has recently been inaugurated. Sir Frederick West, K.B.E., J.P., has accepted the Committee's invitation to become the first president.

Providing reasonable support is forthcoming, arrangements will be completed for the commencement of activities of the club, including a full programme of Luncheon Meetings and speakers for the coming session. The first Luncheon Meeting is provisionally fixed for October.

The club's *Bulletin* for July gives details as to membership, etc.

### Change of Name

The River Preserving Co., Ltd., is now known as Golden Ring Works, with offices at Rosebery Avenue, Tottenham, London, N. 17.

### Danish Bacon Co., Ltd.

The net trading profit for the year was £205,581, to which is added the amount brought forward of £3,399, making a total available of £208,980, with a distribution of 5 per cent. as interim dividend on the Ordinary shares and 5 per cent. on the Preference, some £20,000 gross; provisions for taxation stand at £161,831.

### R. S. M'Coll, Ltd.

Messrs. R. S. M'Coll, Ltd., manufacturing and retail confectioners, Glasgow, had a balance of profit for the year to April 20, 1945, after charging £22,036 (£13,821) for taxation, of £24,450 (£16,866), and £2,360 (£2,244) was brought in. The transfer to taxation reserve was £14,500 (£7,000), and the Ordinary dividend is maintained at 5 per cent., leaving £2,560 to be carried forward.

### Smithfield Animal Products

The profit for the year, before taxation, but including an allowance by Fabon, Ltd., of £2,857 for the years 1942-43, amounted to £14,944, compared with £5,745 for the previous year. The profit after taxation, but before transfer to reserve, and before allowing for the dividend to be paid, is £6,444, compared with £245 for 1943. The sum of £2,500 was transferred to general reserve and the payment of a dividend of 10 per cent., less tax, recommended.

### Metal Box Company

At the twenty-fourth annual general meeting Sir Robert Barlow, chairman and managing director, in his statement circulated with the report and accounts, said that the balance of profit available was £242,428, as against £229,579 last year. The board had appropriated a further £75,000 to the development and reorganisation reserve, bringing this reserve up to £325,000. An interim dividend of 5 per cent. was paid on the Ordinary stock on January 1, 1945, and a final dividend of 10 per cent. and a bonus of 2½ per cent. was recommended for the eighth year in succession.

### Company Law Amendment Report

The Report of the Committee on Company Law Amendment has recently been published as a White Paper (Cmd. 6659). Copies can be obtained from H.M. Stationery Office or through any bookseller. Price 2s. net.

### W. J. Bush and Co., Ltd.

At the forty-eighth annual general meeting of W. J. Bush and Co., Ltd., the proposed final dividend of 6 per cent., making 10 per cent. for the year, was approved.

### Lovell and Christmas, Ltd.

The profits for the year, including £20,000 from taxation reserve, are £178,555 4s. 10d. as compared with £179,381 0s. 2d. for the previous year. The decrease in the profits on trading, rents receivable, dividends on investments, etc., as compared with the previous year, is £20,827 18s. 10d. This decrease is the combined result of a decline in profits on trading and reduced dividends from subsidiary companies.

The directors recommend the payment of a dividend of 6 per cent. on the Ordinary shares, which will allow £25,000 to be placed to the credit of the general reserve account and £12,000 to be appropriated in reduction of the goodwill item in the balance-sheet.

### McDougalls Trust, Ltd.

In his statement at the twelfth annual ordinary general meeting of McDougalls Trust, Ltd., Mr. Kenneth A. E. Moore (the chairman) said that the salient points of the accounts were that during the trading year ended March 31, 1945, the net earnings of McDougalls, Ltd., after provision for excess profits tax and contingencies, amounted to £280,848. Out of this £202,000 was absorbed by dividends payable to McDougalls Trust, Ltd.—the sole beneficial shareholder—and £8,761 had been applied in payment of staff bonuses. The rest, after provision for income-tax at 10s. in the £, had been ploughed back into the business.

The net income so ploughed back was, therefore, of the order of £35,000, of which £25,000 is reflected in the appropriation to advertising reserve. In addition, £50,000 had been added to general reserve and £35,000 to income-tax reserve from the appropriation account. These latter sums, however, were not provided out of the profits of the year, but out of the provision for excess profits tax and contingencies made in earlier years. On a review of the position at the conclusion of the European war it was found, as things have turned out, that there was a surplus provision of £85,000 under this head and such surplus had, therefore, been dealt with as indicated.

# Overseas Items

## Improved Cellophane

A new line of improved cellophane announced by the Sylvania Industrial Corporation of New York features such characteristics, not heretofore available, as low temperature flexibility, extreme toughness, high moisture-vapour resistance, and improved resistance to intense heat and cold.

## Effects of Fat Rancidity

The *Nutritional Observatory* reports that rancid fats, when mixed with other foods, may destroy specific vitamins as well as unsaturated fatty acids. Other nutritive essentials also may be affected, such as ascorbic acid, pyridoxine, pantothenic acid and biotin. Experiments with animals have demonstrated that rancidity can lower the nutritive value of fats and oils; in other foods containing a smaller proportion of fat the effect is apparently similar.

## Baitless Rat Trap

The electronic rat trap will shortly be produced in unlimited quantities for civilian needs, it is announced by Electronic Traps, Inc., Rochester, N.Y.

The inventors of the electronic trap point out that the rat has certain ingrained characteristics which, when known, can be used to assist in its downfall; the most important include the fact that it does not like dead-end streets, and is very reluctant to tread on unfamiliar surfaces. He almost invariably takes the same route from his hiding place to the spot where he seeks food and water.

For this reason, the Rochester automatic trap has no floor and is open at both ends. The trap is placed where tracks and droppings indicate that the rat runs, and is plugged into any convenient electrical socket. When the rat enters the tunnel he breaks an unseen electric eye beam which slams both tunnel doors shut. In the same action, a small door at the side of the trap opens. Seeking to escape, the rat dashes through the opening and up a ramp carrying a slight electric charge. This spurs him on into the electrocution chamber, where he is clamped tightly in a vice of electrodes, killing him instantly. The death chamber floor then drops away, depositing the body in a basket outside the trap.

At the same time the trap automatically resets itself for the next victim. The entire procedure is said to average about three minutes. Engineers claim that death of other rats has no restraining effect on the action of subsequent victims.

## New Breakfast Cereal

A breakfast cereal based on apples is being tried out in America. It consists of quick-cooking flour combined with dehydrated apples, sugar, salt, and spices.

## Fruit-drop Inhibitor

Used successfully for several years to dust such crops as cotton and citrus with pest-killing chemical insecticides, the aeroplane now can be used to apply a new form of hormone spray, containing naphthalene ascetic acid in emulsifiable oil, to reduce pre-harvest drop of apples and pears. Hormone sprays, properly used, also help produce better yields, size, colour, and quality; and lessen droppage caused by untimely winds and jarring without affecting normal ripening.

Use of the aeroplane to apply the new form of fruit-drop inhibitor is of major interest to large commercial fruit-growing areas such as the Pacific North-West. The new material is a variation of Du Pont's "Parmone" pre-harvest fruit-drop inhibitor containing naphthalene acetic acid as the active ingredient.

"Parmone," in concentrated form for mixing with water and in powdered form for dusting, has been used successfully for several years; but these older forms, while highly effective for ground spraying and dusting, are not suitable for dispersal from an aeroplane.

"Aware of the need for a product that would give quick and complete coverage of foliage, stems, and fruit, as well as close timing during the critical harvest period, especially over large orchards, our research staff began studies to develop a material that could be sprayed from a moving plane, as well as from the usual stationary or portable ground sprayers," according to officials of the Grasselli Chemicals Department of the Du Pont Company. The new form of "Parmone," containing the right amount of naphthalene acetic acid in emulsifiable oil for spraying from an aeroplane, resulted.

A pint of the diluted spray (11 gallons of "Parmone" aeroplane spray to 19 gallons of water) usually covers an average size tree, compared with 25 to 40 gallons of the older materials needed to apply approximately equal amounts of naphthalene acetic acid.

The agitation of the air caused by the whirling propeller helps disperse the mist evenly over both the surface and interior areas of the tree.

## Fish for Greece

As part of an UNRRA plan to restock Greek lakes, which were virtually emptied of fish by the Germans, R.A.F. pilots have flown 100,000 grey mullet—a fish rich in protein—to Greece.

The fish were offered by the Fisheries Department of the Egyptian Government, which also supplied oxygen to be pumped into the fish containers during the flight across the Mediterranean.—*Reuter.*

## Tea in Tablet Form

Concern over rising costs of tea production in Ceylon recently led to an extensive inquiry by the Tea Research Institute into manufacturing processes. As a result, tea can now be reduced to a tablet form, which is much cheaper to produce and transport, and will no doubt be cheaper to consumers.

This new method of producing fermented tea is simple, and eliminates withering, rolling, and grading. The whole manufacturing process takes two hours instead of the usual twenty-four. The green leaf, on arrival at the factory, is pulped between stainless steel rollers, and the fermentation thus initiated is completed in an hour. The pulp is then dried in an ordinary tea-drier and compressed.

The liquoring qualities of "tablet tea" are judged by tea-tasters to be very good, and about half as strong again as normal tea. It is thus declared to be economical in use, and of unimpaired flavour and quality.—*The Times.*

## New Insecticide Discovery

The discovery of new and powerful insecticides and new types of parasitic insect control has enabled American farmers to reduce losses in fruit, vegetable, and poultry crops to a remarkable degree, according to reports released by the Agricultural Research Administration of the U.S. Department of Agriculture, Washington.

The discovery that a poison bait, containing sodium fluosilicate, kills both the Puerto Rican and southern mole cricket has placed in the hands of vegetable and berry growers an effective method of controlling, at reasonable cost, pests estimated to cause an annual damage of over 1,250,000 dollars in the Southern states. The average cost for the poison-bait treatment is less than 1.50 dollars an acre, for a simple mixture of 8 lb. of the sodium chemical mixed with 100 lb. of mill-run bran.

In three years, from 1929 up to 1931, a parasitic insect imported from Malaya was used by entomologists to

remove the impending danger of citrus blackfly, a pest that is destructive to oranges, lemons, mangoes, and many other plants in Cuba. Work was directed against these parasites by the introduction of a parasitic wasp, also of Far Eastern origin, which lays its eggs inside the larva of the blackfly and kills it.

Within nine months after the introduction of this control method Cuban citrus groves were free from further injury and danger of the blackfly pest spreading from there to other countries was practically eliminated.

In 1941 the insecticide aerosol in bomb form was invented by Mr. W. N. Sullivan, entomologist, and Mr. L. D. Goodhue, of the Division of Insecticides Investigations for Mosquito Control Work. Since this discovery more than 16,000,000 "aerosol bombs" have been distributed to protect the armed forces against malaria-carrying mosquitoes. The bomb is a small metal container which applies insecticides in a new way by suspending them in the air in a thin mist, which remains active for a longer period than sprays. The use of this insecticide is currently restricted to the armed forces, but is expected to be of great value in peace-time, when malaria control in civilian areas will undoubtedly be intensified.

## Commercial Conditions Overseas

A series of reviews of commercial conditions covering 28 countries is being prepared by the Department of Overseas Trade in collaboration with its resident officers abroad. These give an account of pre-war commercial conditions in each country and describe the changes in economy which have occurred during the war, and refer to industrialisation and the opportunities which exist for the sale of United Kingdom goods.

During the war years there has been little chance for exporters to go overseas, and this has resulted in a lack of the up-to-date knowledge which practical experience brings. The reviews give to firms now engaged in developing their export trade plans valuable information about market possibilities in most of the world.

Conditions in Mexico, Egypt, and New Zealand are the first to be reviewed. The booklet concerning Mexico gives an account of its pre-war economy, touching upon the special object of the Constitution of 1917 and the "Six Year Plan" of 1934 on the trend of the Republic's economic development, and also surveys the opportunities which exist for the sale of capital and consumer goods. A comprehensive survey of the growth of industrialisation during the war and the post-war market for goods of United Kingdom manufacture are features of the review on Egypt. It also draws attention to the probability of a large demand in the immediate future for capital goods, machinery spares, and high quality consumer goods.

The reviews are obtainable, as published, from His Majesty's Stationery Office, and its provincial branches, or through any bookseller at 6d. or 1s. net, according to length. A subscription may be taken out to cover the twenty-eight countries for £1.

## New Canned Meats

Canadian meat packing companies are now producing new types of canned meat products to feed Europe. Canada is supplying UNRRA and liberated countries with 10,000,000 lb. each of canned blood sausage, meat spread and meat paste, all processed from cuts and by-products for which there is little Canadian demand.

These canned foods, never before made in Canada, are a blend of such meats as cheeks, tripe and kidneys with oatmeal or flour and seasoning. Blood is the major ingredient in the canned blood sausage, but this product and the meat paste also contain pressure-cooked bones of young livestock. These contribute calcium and phosphorus, as well as fat and protein.

The new products are in addition to 50,000,000 lb. of canned luncheon meat which packers began manufacturing last autumn, of which 32,000,000 lb. already have been shipped to UNRRA and for military relief. It is also in addition to 32,000,000 lb. of pork loaf and canned ham loaf, of which Canada last year exported 32,000,000 lb. to Britain and about 7,000,000 lb. to other countries.

## The Rancimeter

A machine called the rancimeter, developed by research chemists of Ralston Purina Company, does a quick, accurate detective job on the potential saleable life of cereals, states Frank E. James in *Food in Canada*, 5, 8, 15. Whereas other tests may take up to four months to get data as to stability of packed cereals, the "accelerated deterioration" accomplished in the Ralston equipment gives the answer in half a day. This is an important factor when a new or changed product is to be marketed.

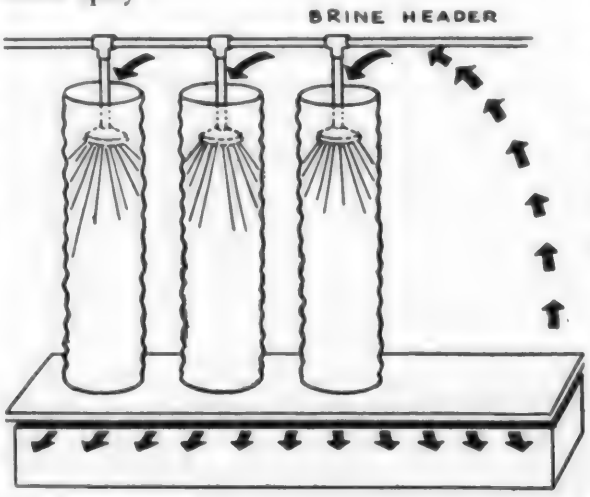
The other major advantage of the rancimeter comes from its ability to diagnose all of the several factors that may contribute to rancidity, whereas other processes check only some of the factors.

Titration tests made at 30-minute intervals as a part of the rancimeter process show a definite change as the tested material reaches the "breakdown" point or state of rancidity, and this lapse of testing time, interpreted into months, tells approximately how long the product will remain saleable on the grocer's shelves.

## How America Eats

With a desire to compare and contrast methods and mechanisms used in catering on a large scale in the United States, the directors of Barkers (Contractors), Ltd., sent Mr. Robert Stent and Mr. Alfred Edwards, M.P., on a special mission for this purpose. The results are set out in a book entitled "How America Eats," being a survey of commercial catering in the United States during March, 1945, with reproductions of actual menus, and published at 2s. 6d.

## Novel Spray




Common road culvert is employed in the manner shown here in making a simple yet effective brine spray cooling system in one meat plant. Warmer air is pulled into the culvert tubes at the top and the cooled air is expelled through an opening along the edge or through apertures in the casing at the bottom. Brine drops into the casing and is pumped from it.

# News from the Ministries

## Appointments and Resignations

Mr. Evelyn Walkden, M.P., and Lieut. Fred Peart, M.P., have been appointed Parliamentary Private Secretaries to the Ministries of Food and Agriculture respectively.

At the request of Peat, Marwick, Mitchell and Co., the Minister of Food has agreed, with regret, to release Mr. J. T. Corbett, Principal Assistant Secretary, Supply Department, from his post from August 31, 1945.

## Home Produced Canned Fruit

Some canned plums and small quantities of other varieties will be available to the public some time during the winter. In the meantime, as in former years, while supplies are being despatched to wholesalers and retailers, sales to the public, caterers and manufacturers are being prohibited by an Order (The Canned Fruit [Prohibition of Retail Sales] Order, 1945) which came into effect on August 8.

## Stepping up the Milk Supply

"Artificial insemination, when it gets firmly established, will be a real contribution to the improvement of livestock amongst the smaller farmers." This view was expressed by Sir William Gavin, K.B.E., permanent Agricultural Adviser to the Ministry of Agriculture, when he formally opened the Artificial Insemination Centre at Ilminster recently established by Horlicks Farms and Dairies, Ltd.

This centre offers artificial insemination facilities to all dairy herd owners in a wide area throughout South-West Somerset, and an advisory committee of local farmers has been chosen to ensure close collaboration between the herd owners and the centre, which is magnificently equipped. The thirteen superb pedigree bulls have all been specially chosen because they have, as the phrase goes, "a lot of milk and good butter fat behind them."

"It will be very many years," said Sir William Gavin, "before we can produce in this country all the supplies of milk we want." Many competent authorities agree that the day will come sooner, if artificial insemination is energetically developed. The Ministry of Agriculture has frequently pointed out the importance of trying to close the gap between our pedigree herds, which are the best in the world, and the ordinary run of our dairy cattle. This is what the technique of artificial insemination sets out to do—and indeed it has already done so in substantial measure and on a large scale, in both the United States and the Soviet Union.

## Bilberry Pulp

Supplies of bilberry pulp will be imported this year from Eire. This pulp is intended primarily for the manufacturers of jam and jelly, but caterers desiring to obtain it for use in their businesses should apply for an import licence to the Ministry of Food, Fruit Pulp Section, Carlton Hotel, London, S.W. 1. The price of the pulp is not controlled, but applicants for a licence must state to the Ministry the c.i.f. price quoted to them. The Ministry will not grant a licence when the price quoted is excessive.

The pulp is preserved in sulphur dioxide, and will therefore only be useful to caterers with facilities for driving off the sulphur dioxide by prolonged boiling.

## Pest Control Preparations

The Infestation Order, 1943 (S.R. & O., 1943, No. 680), provided for the licensing of pest control undertakings with a view to ensuring safety and efficiency in pest control, and the Minister of Food has now made an Order, S.R. & O., 1945, No. 847, nominating October 1, 1945, as the appointed day contemplated under Article 7 thereof. On and from this date the manufacture or preparation of pest control articles is subject to licence, and those concerned who have not yet applied should do so forthwith to the Ministry of Food (Infestation Division), University College, Gower Street, London, W.C.1.

The provision of service for prevention or treatment of infestation does not require to be licensed. This will be the subject of a further announcement.

## Ministry of Food Staff

Following prevalent rumours in Colwyn Bay regarding the transfer of some of the divisions of the Ministry of Food back to London at an early date, the Ministry issued the following official statement:

"While the return to London of a part of the staff of the Ministry of Food is contemplated in due course no date can yet be fixed for such a move, which cannot in any event take place before the late autumn. Even when the move takes place a very substantial part of the staff of the Ministry (estimated at considerably more than 50 per cent.) will remain in Colwyn Bay as long as their work lasts."

## Allocation of Preserves

From September 16, 1945, the allocation of preserves for miscellaneous and manufacturing users reverted to its former level of 50 per cent.

## Oil and Fat Allocations

The following types of oil/fats were allocated to trade users from September 16, 1945: Against cake margarine datum, compound cooking fat, lard, dripping, oil; all cake margarine, compound cooking fat, lard, dripping, oil, with the exception of fish friers in England, Scotland, and Wales, who will receive 50 per cent. of their soft oil authorisation in the form of dripping.

## Manufacturing Meat

The general butcher's manufacturing allowance was reduced from 5 per cent. of their ration meat authorisations to 4 per cent. from August 12. The allowance will be calculated for the time being on the ration meat authorisations for the first week of the new registration period and will still include the equivalent of the allowance on U.S.A. hog sides issued against the ration. Allocations to other manufacturers will be similarly reduced.

## Advisory Committee on Dehydration

The Minister of Food and the Agricultural Ministers have jointly appointed an Advisory Committee composed of producers and processors to consider all matters relevant to the development of the dehydration of vegetables and fruit and to make recommendations on such matters including technical developments, types of varieties which are suitable for dehydration, and the form of contract which would be best used by dehydrators for the purchase of raw vegetables and fruit.

The chairman of the Committee is Mr. J. P. Van den Bergh, Director of Dehydration, Ministry of Food.

## Standards for Salad Cream and Mayonnaise

When the Minister of Food makes the Order prescribing the standard for salad cream and mayonnaise, details of which have already been announced, it is proposed to exclude a product sold as a salad sauce or any other salad dressing from compliance with the Order only if its container bears a label stating that "This product is not a salad cream or mayonnaise and does not comply with the statutory standard prescribed for those products." As previously announced, labels on containers of non-standard salad dressings will also be required to include a statement of ingredients.

## Fuel-Saving and Fuel-Burning Equipment

In order to assist the change-over of industry to peace-time production the Board of Trade have for some time been engaged in simplifying the licensing control on the supply of individual items of plant and machinery. Wherever practicable the Board of Trade are now issuing bulk licences to the machinery manufacturers, authorising them to supply controlled machinery and plant up to a value related to the capacity expected to be available for a period ahead. The statutory basis of this scheme is the Machinery Plant and Appliances (Consolidation) Order, 1945 (S.R. & O. 1945, No. 631). (See the Articles on pp. 253 and 263 of the Board of Trade Journal of June 9, 1945, for a fuller description of this control.)

The system of bulk licensing is now to be extended to those items of fuel-saving and fuel-burning equipment which the Ministry of Fuel and Power have been authorised to license during the past eighteen months. The Board of Trade, therefore, propose to issue bulk licences to the manufacturers of most of the controlled goods affected, and, as these are granted, it will no longer be necessary for purchasers to obtain individual licences from the Ministry of Fuel and Power in order to acquire goods from the licensed manufacturers. After September 30, 1945, no further licences were issued by the Ministry of Fuel and Power, but supplies by manufacturers will be subject to licence by the Board of Trade (Industries and Manufactures [Engineering] Department, Millbank, London, S.W. 1).

While it is hoped that this alteration in licensing procedure will be accompanied by an increase in the production of fuel-saving equipment, so necessary to meet the coal position during the coming winter, the Ministry of Fuel and Power Regional Fuel Efficiency Committee Secretaries will make every effort to assist purchasers who find difficulty in securing delivery of such equipment.

The Ministry of Fuel and Power have one particular warning for firms considering the purchase of new fuel-burning equipment. The fuel supply position remains one of acute difficulty, and this state of affairs is likely to persist for a long time to come. It would, therefore, be extremely unwise to install fuel-saving or fuel-burning equipment either as additions to, or replacement of, existing plant without first ensuring that fuel suitable for the type of appliance will be forthcoming. Intending purchasers of equipment should, therefore, first ascertain from the manufacturers what fuels can be used in the appliance, and then consult their suppliers of coal, coke, gas or electricity, or in the case of liquid fuels the Petroleum Division of the Ministry of Fuel and Power, 7, Millbank, London, S.W. 1, to satisfy themselves that suitable fuel supplies will be available, and that there is a reasonable prospect that they will continue to be available. Any firm installing new equipment which fails to take these precautions, and as a result finds itself in difficulties later on, will have only itself to blame.

It should be noted that the Ministry of Works' control over individual building schemes has not been relaxed. If building work is necessary to enable the plant or machinery to be installed, the purchaser should make application to the appropriate Regional Licensing Officer, Ministry of Works, for the necessary building licence. The Ministry of Fuel and Power will, as before, be responsible for the sponsorship of applications for building licences to install plant and equipment in order to save fuel.

---

## Imports from Italy

It was announced in Rome on August 2 that Allied control over Italian export trade has been withdrawn and that henceforth the Italian Government and Italian firms will be free to conduct direct transactions with foreign firms. British importers are reminded that trading with the enemy restrictions have not yet been lifted in respect of trade with Italy, so that it is not yet possible to conclude a contract with the Italian Government (or Italian private traders).

Enquiries may, however, be made of Italian exporters as to availabilities, terms of sale, and prices of goods. British importers are also reminded that when transactions are permitted import licences will be required for all goods imported into the United Kingdom from Italy which do not come under an open general licence. Import licences will not, in general, be granted for goods not, for the time being, licensed from other countries. Import licences will not normally be considered for food, the import of which will continue to be conducted by the Ministry of Food.

---

## Business Communications

The Board of Trade wish to make it clear to traders that there is full freedom of business communication with Holland, Norway, Greece, Yugoslavia, Czechoslovakia, and Poland subject to the requirements of Trading with the Enemy legislation. This means in practice that it is not possible to enter into firm commitments regarding the exchange of goods or the making of payments, but that correspondence is permitted regarding such matters as prices and terms of delivery in anticipation of the resumption of trade.

## Properties in Germany

The interests of United Nations owners of property in Germany are being safeguarded by a special department (Property Control Branch) of the Control Commission. As far as British owners are concerned, all communications should be addressed to the Trading with the Enemy Dept., 24, Kingsway, W.C. Owners of property in Germany should already have made a return in regard to such property to this Department.

As information becomes available, individual owners will be notified in regard to the condition of their property; but at present no enquiries by interested parties as to the state of specific properties in Germany can be dealt with by the Trading with the Enemy Department. It is inevitable in the circumstances prevailing in Germany that information will be available to some owners before others, and those who receive no news as to their property can rest assured that their interests are being guarded as far as practicable by specialist officers of the Control Commission, and that information will be forwarded to them as soon as possible.

---

## Industrial Electrical Equipment

The Ministry of Supply announce a considerable simplification and relaxation of the licensing procedure for industrial electrical equipment and the Control of Industrial Electrical Equipment (No. 4) (Revocation) Order, 1945, has been issued for this purpose.

From August 20 it became unnecessary for an acquirer to obtain a licence before placing an order for any industrial electrical equipment.

A system of Selective Control, similar to that now applying to metal working machine tools, has been introduced to take care of Service and other essential requirements for certain items where the supply position does not permit of complete relaxation of licensing. These items appear on a Nominated List, and orders for them can only be accepted by suppliers under the authority of a Supply Licence issued by Machine Tool Control, except where the transaction is covered by one of the exemption clauses. The present Nominated List comprises D.C. motors, D.C. and A.C. generators, static condensers designed for power factor correction, and automatic voltage regulators.

---

## Admixture of Imported Flour

The rate of admixture of imported flour was reduced in all areas except Northern Ireland from August 19 to 5 per cent. calculated as a percentage of the total product containing the admixed flour. This follows a reduction to 10 per cent. which took place in all areas on August 5.

# Information and Advice

## Synthetic Cream

B.267. *Enquirers are interested in the making of synthetic cream of a semi-solid type for use by bakers. They also ask whether there is any particular kind of fat which gives the best results in the making of such a cream. For instance, hardened groundnut oil appears to be the most successful, but this oil, ordinary bakers' compound, and very often margarine are used.* (Scotland.)

As to the type of oil suitable for the purpose, this can only be ascertained by experiment, and we suggest that you make a trial yourselves as to whether hardened groundnut oil alone would give better results than a mixture.

We transcribe a paragraph from Bennion and Stewart's book, *Cake Manufacture*, which may be of assistance to you: Confectioners and others who wished to produce synthetic cream in past days have used unsalted butter or unsalted margarine with milk and milk products, as these made the production of an emulsion easier, and affected the whipping properties. Since there is a shortage of milk and milk products the Ministry of Food has prohibited the use of them in synthetic cream for commercial use. The research bakeries of our allied traders have tried to overcome this difficulty, and after extensive experiments have developed the following formula, using only permitted ingredients. The cream produced whips well and is quite satisfactory. The following will make about one gallon of synthetic cream:

6 lb. water
6 oz. cornflour
3¾ lb. unsalted margarine or cooking fat
½ gill egg yolks

Make a paste of the cornflour and a portion of the water. Boil up the remainder of the water, add the cornflour paste, and cook until it gelatinises, but keep stirring to prevent it burning or forming lumps. Cool the mixture to 150° F., and add the melted fat slowly to it while stirring. When the mixture reaches 130° F., add the egg yolks and pass through the emulsifier. Store the emulsion in a refrigerator for some hours before use. Whisk up to the consistency of whipped cream while it is still cold.

## Normal Propyl Alcohol

B.285. *Information required as to the suitability of using normal propyl alcohol in the manufacture of essences for foodstuffs.* (London.)

There is little doubt that normal propyl alcohol is rather more toxic that isopropyl, though the greater toxicity is not large. Macht found that by intraperitoneal injection the toxicity of normal propyl alcohol was 2 ml. per kilo bodyweight as compared with 2·5 ml. for isopropyl alcohol. Lendle found 4 ml. compared with 8 ml. for ethyl alcohol, 1·2 ml. for normal butyl alcohol, and 0·6 ml. for normal amyl alcohol. On account of the excitement of the mucous membranes, Rost and Braun found it impossible to feed doses large enough to dogs as it caused severe vomiting. Narcotie doses can probably be assumed to be approximately half lethal doses.

It is therefore doubtful whether there would be much risk attached to the use of normal propyl alcohol as a solvent for essences, but the manufacturer would have to decide for himself whether he is prepared to accept any risk involved. The actual danger is probably negligible, but it is difficult to foretell what might be the attitude of a Court in the event of a claim being made.

## Information Supplied

B.219. *Name and addresses of firms manufacturing automatic weighing and packing machines for substances like semolina, rice, etc.* (London.)

B.220. *Details regarding a small canning outfit and pressure cooker and information on the preservation of strawberries.* (Hereford.)

B.229. *Manufacturers of powder filling, wrapping, and sealing machines for packing infants' food powders and other similar lines, preferably with a moisture-proof package.* (Lancs.)

B.230. *Names and addresses of manufacturers of machinery for filling, weighing, packing, and sealing (all one machine) packets of flour up to and including 3 lb.* (London.)

B.239. *Particulars of firms supplying blackberry and other fruit pulps.* (Derby.)

B.240. *Information concerning the requirements of canned foods, pickles, etc., so that they can be exported to the Colonies and Dominions, particularly Australia, New Zealand, and South Africa.* (London.)

B.246. *Addresses of firms dealing in blood albumen.* (London.)

B.247. *Information in connexion with "The Confectionery Industry" appearing in the April issue of* FOOD MANUFACTURE. *(U.S.A.)*

B.252. *Details of flooring suitable for a cheese and butter factory.* (London.)

B.253. *Recipes and processes for making rusks for sausage manufacture.* (Ireland.)

B.262. *Information on the process of quick freezing of foodstuffs.* (Cornwall.)

B.263. *Good quality mixtures and quantities for the manufacture of ice cream.* (Flints.)

B.265. *Advice as to the method of preserving liquid egg in tins or bottles without using preservatives.* (London.)

B.266. *Details of the new photographic process described in the June issue of* FOOD MANUFACTURE. (Scotland.)

## Information Required

B.304. *Names and addresses of manufacturers of cork-lined sleeves and straw envelopes for the packing of jars.* (London.)

B.351. *Required names and addresses of manufacturers of machinery for roasting, peeling, and grading cashew nuts.* (London.)

# Recent Patents

*These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).*

### Specifications Published

*Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.*

570,017. SUTCLIFFE, J. W., and SUTCLIFFE, T. C.: Machines for the application of closure caps to bottles, jars, cans, and the like receptacles.

570,101. IMPERIAL COLLEGE OF TROPICAL AGRICULTURE (Yearwood, R. D. E.): Manufacture of sugar.

570,249. MORAN, H. W.: Means for tilting cooking receptacles during use.

570,268. BELLAMY, A. J., and EGG PATENTS, LTD.: Egg product.

570,363. INTERNATIONAL YEAST CO., LTD.: Treatment of yeast and product.

570,407. KOOPERATIVE FORBUNDET FORENING U.P.A.: Apparatus for extracting fruit juice by means of steam.

570,412. STYLES, C. F.: Machines for extracting juices from fruit, vegetables, and the like.

570,437. WICKENDEN, L.: Method of treating sugar melts.

570,525. PRICE AND SON (STAMPERS), LTD., T., and PRICE, E. E.: Electrically heated cooking vessels and kettles.

### Abstracts of Recent Specifications

#### Apparatus for Vacuum Sealing of Jars or Wide-Mouthed Bottles and the like

This invention consists in improvements in or relating to apparatus for sealing bottles and jars, particularly those having wide mouths and used for preserving jam, fruit, vegetables, and the like.

An object is to provide a simple means by which vacuum sealing of such jars or bottles can be effected under ordinary domestic conditions with simple and comparatively inexpensive apparatus.

Means for effecting the vacuum sealing of bottles or jars comprise in combination a hydraulically operated exhaust pump capable of actuation from a household water service, a suction pipe connexion leading from the pump, and a nozzle which is connected to the suction pipe and is formed with a through passage that is designed to be placed in register with an exhaust orifice in the cap or cover of a jar or bottle with a rubber sealing disc or patch interposed between the nozzle and the face of the cover, which nozzle has a face into which the through passage opens and which is so formed that it will frictionally engage the disc or patch to turn the latter relatively to the cap or cover for the purpose described.

The invention also includes means for effecting the vacuum sealing of bottles or jars consisting in an outfit which comprises an exhaust pump, a rubber or like disc or patch or a plurality of such discs or patches, each formed with a suction orifice capable of registering with the through passage in the nozzle, and a cover or plurality of covers each formed also with an exhaust orifice to be employed in conjunction with a disc or patch and the exhaust pump in the manner hereinbefore described.

The cap for the jar or bottle may be of metal or mouldable material, and between the cap and the mouth of the jar or bottle there will be the usual rubber or like ring to effect the requisite seal when the jar or bottle has been exhausted.

Conveniently, the cap is provided with a circular depression in which a circular rubber or like sealing washer is received and located, and in which it can be turned for the purpose above described by means of the suction nozzle.

*565,129. Francis Anthony Rikh.*

## Trade Marks

*The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).*

**STEVONIAN.**—632,415. Flour, bread, biscuits (other than biscuits for animals), cakes, and confectionery (not medicated). **John Stevenson (Glasgow), Ltd.,** 142, Calder Street, Glasgow, S. 2, Scotland; Manufacturers and Merchants.

**ECONOTEA.**—632,460. Tea. **Frederick Colbourne Miller,** trading as **Economy Tea Company,** Ceylon House, 49/51, Eastcheap, London, E.C. 3; Tea Blender and Packer.

**SYLVITA.**—632,572. Bread. **J. Luton and Son, Ltd.,** 226, North Street, Ashton Gate, Bristol; Manufacturers and Merchants.

**FLAVROMA.**—632,764. Culinary essences and flavourings, none being essential oils. **The United Yeast Company, Ltd.,** 80, Miller Street, Manchester; Merchants.

**UTATE.**—632,932. Tea, coffee, and cocoa. **Cross, Sons and Absolom, Ltd.,** Ibex House, Minories, London, E.C. 3; Merchants.

**RIMICO.**—633,183. Flour, and cereals prepared for food for human consumption. **The Riverside Milling Company, Ltd.,** Shearer Street, Glasgow, C. 5; Millers.

**KAREEKA.**—633,372. Tea. **Perry and Roulston, Ltd.,** 200, Gt. Homer Street, Liverpool, 5; Provision Merchants.

## New Companies

**Golden Grain Bakery, Limited.** (390901.) 442, Huddersfield Road, Mirfield, Yorks. To take over a bus. carried on at Mirfield as the "Golden Grain Bakery." Nom. cap.: £3,000 in £1 shares. Dirs.: to be appointed by subs. Subs.: D. M. Jones, 21, Marlboro Avenue, Hessle (acct.); J. M. Gibson, 6, Trafalgar Cres., Bridlington (acct.).

**Renoxa Products, Limited.** (396996.) Eagle House, Jermyn Street, S.W. 1. To carry on bus. of manufacturers of and dealers in canned and bottled foods, etc. Nom. cap.: £100 in £1 shares. Dirs.: D. M. McGregor, 28, Gloucester Road, Tankerton; F. A. Davey, C.A., 21, Gloucester Road, Tankerton.

**London Rusk and Spice Company, Limited.** (397213.) 6, Holborn Viaduct, E.C. 1. To take over bus. of wholesale and retail spice merchants carried on at 6, Holborn Viaduct, E.C., by Winstanley Supplies, Limited. Nom. cap.: £1,500 in £1 shares. Dirs.: B. A. Thompson and Mrs. R. Thompson, both of Old Manor House, Wormley, Herts.

**John Tudor, Limited.** (397237.) Waterloo Chambers, Chelmsford. To carry on bus. of manufacturing, wholesale, and retail confectioners, fruiterers, caterers; etc. Nom. cap.: £5,000 in £1 shares. Dirs.: S. W. Miller, 151, Mildmay Road, Chelmsford; B. C. Hawkes, 16, Rainsford Avenue, Chelmsford; N. E. S. Miller, The Crest, London Road, Chelmsford.

**Powell Refrigerating Services (Sheffield), Limited.** (397341.) 231, St. Philip's Road, Sheffield, 3. Nom. cap.: £1,000 in £1 shares. Dirs.: L. Powell and Mrs. E. Powell, both of 59, Westwick Road, Sheffield, 8.

*Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.*